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[OFFICIAL NOTICE.]

Twenty-Ninth Annual Meeting, Western Gas Association.

WESTERN GAS ASSOCIATION,
OFFICE OF THE SECRETARY,
NEW ALBANY, IND., March 21st, 1906.

To the Members of the Western Gas Association: The Twenty-ninth annual meeting of the Western Gas Association will be held in the Hollenden House, Cleveland, O., May 16, 17 and 18, and will be called to order at 10 A.M., by the President, Mr. Paul Doty, of St. Paul, Minn.

The Hollenden, prepared to accommodate 300 guests and furnish a room suitable for the sessions of the Association, announces the following rates. European plan: Rooms with running water, $1.50 and $2; rooms with bath, $2.50, $3, $3 50 and $4; double-bedded rooms with bath, $4 to $5.

The Hollenden, while conducted on the European plan, furnishes meals as follows: Club breakfast—50 cents and upwards; an 8-course lunch for 50, 60 and 75 cents; table d'hote dinner, 65 cents.

The following papers will be presented to the Association:

"Isolated Bench Firing," by Mr. Fred. Bredel, Milwaukee, Wis.

"Electrolysis of Gas Mains," by Mr. M. R. Bump, Denver, Col.

"The Relation of Gas to Our Modern Life," by Mrs. O. N. Guldlin, Fort Wayne, Ind.

"General Data on Artificial Gas Properties," by Mr. W. E. Steinwedell, Cleveland, O.

"Notes on Carbonization," by Mr. W. E. Hartman, Joliet, Ills.

"Regulation of Rates," by Mr. Geo. McLean, Dubuque, Ia.

"Change in Grade of Mains at Galveston," by Mr. John Gimper, Galveston, Tex.

"Labor Saving Machinery for Medium Sized Retort Houses," by Mr. F. H. Shelton, Philadelphia, Pa.

"Making of Rates," by Mr. W. H. Gardiner, Jr., Boston, Mass.

"Some Brief Notes on Capacities of Water Gas Sets," by Mr. Rollin Norris, Philadelphia, Pa.

"A Balance between Calorific Value and Candle Power in Water Gas," by Mr. T. D. Miller, New Orleans, La.

"The Utilization of Tar in a Water Gas Apparatus," by Mr. Geo. H. Waring, Omaha, Neb.

"Water Gas Practice," by Mr. D. G. Fisher, St. Louis, Mo.

"Extraction of Tar from Water Gas," by Mr. E. H. Earnshaw, Cincinnati, O.

"The Mutual Advantage to be Derived through Co-operation between Engineering Schools and Those Engaged in the Gas Business," by Prof. Chas. F. Burgess, University of Wisconsin.

"The Relations between Gas Companies and their Employees," by Mr. Joseph M. Berkley, Los Angeles, Cal.

"Wrinkle Department," Edited by Mr. B. McAdam, Milwaukee, Wis.

"A Lecture on Industrial Betterment," by Dr. Wm. H. Tolman, New York.

"A Lecture on Engineering of Illumination," by Mr. Van Rensselaer Lansingh, New York.

A banquet will be arranged for Thursday night and an entertainment provided for the ladies. Further details will appear in a future announcement.

Arrangements with the various Passenger Associations will be made for reduced rates on the certificate plan. The Secretary will be pleased

LIBRARY OF CONGRESS, SMITHSONIAN DEPOSIT.

to furnish application blanks to those wishing to become members of the Association.

A cordial invitation is extended to members of kindred Associations to be present. JAS. W. DUNBAR, Secretary.

BRIEFLY TOLD.

THE FIRST STEP TOWARD THE ORGANIZATION OF THE NEW ENGLAND SECTION OF THE ILLUMINATING ENGINEERING SOCIETY.—About 75 representatives of the gas, electric light and kindred industries were present at an informal meeting, preliminary to the organization of the New England Chapter of the Illuminating Engineering Society, held in the American House, March 20th. The meeting was called to order by Mr. J. S. Codman, and Mr. John Campbell was unanimously chosen to fill the post of Chairman.

Mr. Campbell emphasized the value and necessity of such an organization in which the contractor, the fixture designer, the architect, the engineer, the gas and electrical men could meet on a common footing as engineers interested in the subject of best illumination and the best methods of obtaining it; and also the value of such an organization to the general public who, at the present time, have no means of accurately determining in their own minds the different methods, prices and advantages of the different forms of illumination.

Mr. L. B. Marks, of New York, President of the parent society, said this was the first meeting to form a branch society, and that a movement was on foot to form the second in Chicago. He laid stress on the fact that men engaged in all kinds of business concerned with illumination were wanted in the organization, including architects, contractors and fixture dealers. While any antagonism with existing organizations was to be avoided, it was considered distinctly desirable to have a new and independent organization rather than to become a wing of any already established. Such a a society as was on foot, he said, could do a valuable work in impressing the public with improved devices and methods of illumination.

An illustrated paper on the inverted gas mantle lamp, given by Mr. Victor A. Rettich before the New York Society, was read by Mr. J. S. Codman, of Boston. In the discussion that followed many interesting points were debated. Mr. A. H. Elliott, of New York, read a paper on the flaming arc lamp, or, as he preferred to call it, the luminous arc, of which much is expected when it shall have been perfected. Dr. Louis Bell increased the value of the discussion by his remarks.

Mr. W. D'A. Ryan was called upon and responded by a discussion of the flaming arc illustrated by a series of curves showing the distribution of light in the different forms of arc lamps, which showed some highly interesting results. Dr. Bell, Mr. Elliott and others took prominent parts in the discussion.

Twenty-six of those present signed applications for membership, and a committee of Messrs. J. S. Codman, Dr. Louis Bell, W. W. Cummings, Chas. B. Burleigh, H. H. Brown, and Mr. Campbell as member ex-officio, was appointed to perfect and present plans for organization at a meeting to be held in April, the date of which will be announced later. At present there are nearly 50 members in New England, and the work of the local chapter will readily bring the membership up to 100 in a short time.

NOTES.

MR. S. F. HAYWARD is at home again after a trip to Jamaica, W. I., on which occasion he was ably assisted by several members of his family. The journey took up something more than a month and was well enjoyed, even though he asserted that he was "glad to be back." The "Governor" looks all right.

ON March 22d the employees of the Watertown (N. Y.) Gas Light Company held a meeting for the purpose of considering the advisability of forming an organization for their mutual advancement. The meeting was called to order by Mr. H. W. Davies, General Superintendent of the Company, who briefly stated that the object of the meeting was to learn the sentiment of the formation of a local association for the purpose of mutual advancement along the lines covered by the manufacture and distribution of gas. He then introduced Mr. George E. Harris, of the General Gas Light Company, of New York, who spoke to the men most interestingly on the work and benefits to be derived from such an association as it was proposed to organize. After a general and thorough discussion it was decided to organize a permanent association, and the official staff to govern it for the first year was named as follows: President, William Nehls; Vice-President, Thomas Miller; Secretary-Treasurer, R. J. Ryan.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.—CONTINUED FROM PAGE 532.]

THIRTY-SIXTH ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

HELD AT YOUNG'S HOTEL, BOSTON, MASS., FEB. 20 AND 21, 1906.

FIRST DAY—FEBRUARY 20—AFTERNOON SESSION.

The Association reassembled at 3 P.M.

The President—We were honest in our purpose when saying the meeting would be opened at 2.30 P.M., but two or three matters came up before that hour, one of which is that the report of the Committee on Electrolysis by request will be postponed till to-morrow morning. A gentleman coming from the West, Prof. Brownell, will be with us then without a doubt, but he is not here now. It will be greatly to our advantage and our pleasure if we postpone that report until Mr. Brownell can be present. There are one or two other points in connection with the discussion upon naphthaline that can be continued with excellent results. Mr. McKay suggested we ask Mr. Philbrick, of Brockton, to tell his experience. I don't see the gentleman in the room; but I have sent for him. In the meantime, while we are waiting for both Messrs. McKay and Philbrick, if any other member has any experience will he kindly tell it to the meeting? It is unfortunate, perhaps, that the hour of adjournment arrived just at the time when our friend Mr. Quinn was in his talking mood for the first time in 24 years, as he confessed, but certainly it was a great pleasure to hear what he did have to say. As both sides of the question were very admirably put, it leaves it open for further discussion.

Mr. Gardiner—Mr. President, I would like to ask further about the effect of oil floating on the water in the holder upon the illuminating value of the gas. I was under the impression that various forms of heavy oils were used in scrubbers to extract the benzole from gases which it was desired to free from illuminating qualities. That is, the gases were scrubbed in the usual manner, either by bubbling through bodies of heavy oil or by being passed in close proximity, thinly divided, over surfaces of oil, to extract the benzole from the gases. It seemed to me that as this process of oil elimination of benzole was used, I believe I am correct in stating that it is used for that purpose. By putting similar oils in continuous contact with the gas for the purpose of extracting the naphthaline, it might have a very deleterious effect upon the illuminating value of the gas. It may be that the qualities of oil used for the purpose of extracting naphthaline were such as to give up to the gases certain countervailing illuminating values, hence the increase in candle power stated; but the latter was a great surprise to me. The reason I asked the question primarily was that it had occurred to me, if for some reason unknown the illuminating values were not affected, it might be that oil scrubbers of very constricted form could be used more efficiently for scrubbing out the naphthaline, say at the inlet and outlet of the holders and various other points in the works, where trouble arises from naphthaline. I think small scrubbers, placed locally wherever desired, could be used and the gas passed through these scrubbers. They might be simply in the form of a spray drip of oil circulated continuously. That would obviate the difficulty which was spoken of as having occurred in the Gas Light and Coke Company, of London, where the naphthaline was deposited from the oil on the holder. Of course, naphthaline is taken from the gas into the oil, and when the oil becomes saturated is deposited. By using the oil in scrubber form (circulating it) we could saturate the oil with naphthaline and never allow any excess deposit of naphthaline, and we furthermore would have naphthaline delivered to us in very available form for working up as a by-product. I should like to hear further on the effect of oil on illuminating value. It seems to me that has a very important bearing on the subject and on the possibilities of using oil in scrubber form, as I suggest, for the elimination of naphthaline.

The President—It certainly would have. If I remember, Mr. Quinn stated that his observations indicated an increase in the illuminating power of the gas from the use of that ammonia oil, as he described it, upon the surface of the holder tank of water. In the case of the English Company it was evidently deposited there from the natural course of operations of the manufacture and formed in such quantities that it deposited by its own weight and dropped to the bottom of the tank itself. I don't know that any member here has had experience in the line that you suggest, yet it would appear to be quite possible for the gas to be passed through the oil at that point prior to its going into the holder. Has any member present any experience in that line?

Mr. Africa—In the Philadelphia gas works scrubbers are used similar

to the ones described. They use water gas tar for scrubbing the gas to take out the naphthaline.

The President—And with what success, Mr. Africa?

Mr. Africa—Very good success.

The President—It has been used regularly there, has it?

Mr. Africa—On testing the gas and finding that it has a surplus of naphthaline they run it through these scrubbers.

The President—And with what effect upon the candle power?

Mr. Africa—I have not heard that it was injurious at all.

The President—I think, Mr. Gardiner, that answers in a way your question.

Mr. Gardiner—Mr. Africa spoke of the heavy oils and water gas tar being used in the scrubbers. Do they use them in mixed form, or one following the other?

Mr. Africa—Used principally water gas tar.

Mr. Gardiner—That was what I thought might be the case. In that case would it not be possible for the water gas tar to give up certain lower illuminating values to the gas?

Mr. Africa—It might be possible; yes.

Mr. Morrison—I should like to point out the difference between the two kinds of oil that are mentioned. The one in London was evidently a drip oil from the water gas deposited on top of the water in the holder tank. That is the oil which I understand the Philadelphia people use in a scrubber for absorbing excess of naphthaline. It would, of course, absorb the naphthaline, and in cold weather deposit it in the tank. Mr. Quinn uses a heavy lubricating oil, and uses it evidently simply as a mechanical means of separating the gas and the water. I cannot conceive that that oil absorbs anything from the gas. I don't see how it can absorb naphthaline. Its only object it seems to me is to prevent the gas from coming in contact with the water, absorbing the moisture, thus preventing the moisture when it condenses carrying the naphthaline down with it. That seems to be true, because he does not get the drip water in the outlet to his holder that he did before he used the oil. It doesn't seem to me that the two oils are parallel at all, because the oil from the water gas we know would absorb naphthaline, and has been used successfully, as water gas tar has, in a scrubber to absorb the naphthaline. His oil, it seems to me, is simply a mechanical separation of the gas from the water, and I don't see how he could get any deposit in the bottom of the holder tank or any absorption of the naphthaline by that heavy lubricating oil.

The President—And so, if any mechanical means were to be used to separate the water and the gas from coming in contact with each other the effect would be about the same, or the naphthaline would be eliminated, would it not?

Mr. Morrison—It would seem so. If his facts are so, it would seem as if that were true.

The President—Therefore, it is safe to say that Mr. Quinn's simple method could be used without any danger of the conditions obtaining in the bottom of his tank that were so apparent and disastrous in the tank of the London Company. Has Mr. Philbrick, of Brockton, returned? Perhaps Mr. McKay desires to and will say something upon the naphthaline question before the discussion is closed.

Mr. McKay—I just spoke with Mr. Philbrick, who will be present a little later, perhaps at another session.

The President—Then we can take it up again.

Mr. McKay—He has an interesting experience.

The President—We will hold this, then, in suspension until Mr. Philbrick returns.

Mr. D. D. Barnum, of Worcester, Mass., then read the following paper, entitled,

THERMIC CONSIDERATIONS OF A RETORT FURNACE.

A unit weight of coal contains a certain amount of energy which is expressed in heat units called B.T.U. (one B.T.U. being the amount of heat necessary to raise 1 pound of water 1° F.). The object of the following test is to determine what becomes of the energy in the coal after it is placed in a retort for carbonization. In doing this work, we also determine the characteristics of this general type of furnace, and the conditions that prevail in its working, considered from a thermic standpoint; that is, we determine the efficiency of the retort bench as a heat machine. This paper has nothing whatever to do with the mechanical working of the bench, furnace or retort house.

The bench contains 6 retorts, 10 feet long, 16 inches by 26 inches, with a half-depth furnace of a capacity of 58 cubic feet, and a grate area of 6 square feet. The primary and secondary air are heated directly from the furnace, and not from the flue gases. In making the determinations for the test, the following apparatus and methods were used:

For gas analysis, we used the Hempel apparatus; for coke and coal analysis, we followed the ordinary procedure; in determining the various temperatures, a Le Chatelier pyrometer was employed. The apparatus designed and used by Mr. A. G. Glasgow in his test of a Lowe double superheater set was used to determine the radiation and convection. A Parr calorimeter gave us the B.T.U. in the coke.

In selecting the constants for the specific heats of the gases at various temperatures, I find that different authorities vary, and I have used the figures that have been determined for the temperatures found in this test, wherever possible.

The general scheme is that which was followed by M. Euchene, in his paper read before the Gas Congress at the Exposition, Paris, 1900, and for further study of this subject, I would recommend his paper. There are two sources of heat from the coal to be considered in this test, namely: A, combustion of the coke in the furnace; and B, the heat liberated in the formation of the new compounds when the coal is decomposed in the retort. There are 10 items which show the disposal of the heat, as follows:

1. Heat carried up the chimney by the flue gases.
2. Heat lost in vaporizing the water and raising the resultant gases, CO_2 and H_2O to the temperature of the flue gases.
3. Heat lost in the ashes.
4. That which is carried off through the stand-pipe by the gas.
5. By the tar.
6. By the H_2O in the coal.
7. Heat lost by radiation and convection.
8. That which is taken out of the bench in the hot coke as it is drawn.
9. Heat *absorbed* in the formation of the new compounds in the retort.
10. Heat of decomposition of the coal.

The amount of coke used in the furnace per 100 pounds coal charged in the retort was 17 pounds. The ashes in the pit contained 26 per cent. unconsumed C, due to the coke falling down while clinkering.

The analysis of the coal gave:

	Per Cent.
Moisture	0.24
Volatile matter	4.19
Fixed carbon	87.00
Ash	8.57

In order to figure the net coke consumed, we must take out the coke in the ashes. Of the 17 pounds coke 8.57 per cent., or 1.46 pounds, is ashes; this 1.46 is 74 per cent. of the total ashes and coke per 100 pounds or 1.96 pounds; and 26 per cent. = 0.51 pounds to be subtracted from 17 to get the net coke burned in furnace per 100 pounds coal, or 16.49 pounds net.

One pound of coke gave by the Parr calorimeter 13,076 B.T.U.; 16.49 pounds, therefore, give 215,623 B.T.U. placed in the furnace for each 100 pounds coal carbonized, and is Item A.

Item B.

Heat of formation + and —. In the forming of the new chemical compounds from the coal in the retort we have either an absorption or a liberation of heat, according to the character of the compound formed. The amount of heat either liberated or absorbed for each compound is known, and by multiplying these constants by the amount of gas, as given in our analysis we have the amount of heat absorbed and liberated.

Following is a table giving the analysis of the gas, the amount of each gas per 500 cubic feet of the mixed gases corresponding to 100 pounds coal, and the heat of formation + or — for each gas, and the total heat + and — for the mixture:

Com.	Per Cent.	Total Feet.	Heat Form.	Plus.	Minus.
CO_2	1.1	5 5	463.1	2,548.7	.....
H_2S	1.1	5.5	22.6	124 3	.....
C_2H_4	8.4	42.0	12.9	.....	541.8
O	0.3	.....	.....	.....	.....
CO	6.4	32.00	138.4	4,428.8	.....
H	50.4	.....	.....	.....	.....
CH_4	27.8	139.00	103.1	14,330.9	.....
N	4.5	.....	.....	.....	.....
Tar ($C_{10}H_8$)	....	5.00 lbs.	545.0	.....	2,725 0
H_2O	....	2.37 "	6,870.0	16,282.8	.....
NH_3	....	0.22 "	1,259.0	276.9	.....
				37,992.0	3,267.0

We have, as a result, 37,992 B.T.U. liberated per 100 pounds coal, and this is Item B. There are 3,267 B.T.U. absorbed and that is Item No. 9.

Item B is added to A which makes a total of 215,623
37,992

Expended ..... 253,615 B.T.U.

DISPOSAL OF HEAT.

Item No 1.—The temperature of the air before entering the furnace approximated 60° F., and at the outlet of the bench proper, it was 1,800°. In determining this later temperature a number of tests were made, and the average taken. The analysis of the flue gas gave:

O = 1.0 per cent.
CO = 0 0 per cent.
which determines the CO_2 as 19 per cent.
N = 80 per cent.

The 1 per cent. oxygen represents 5 per cent. more air than was necessary to burn the coke. One pound carbon requires 143.5 cubic feet air for its combustion. Five per cent. excess of air, would, therefore, give 151 cubic feet of air for each pound C consumed. The composition of each 1.51 feet of flue gas will, therefore, be:

CO_2 = 28.69 cubic feet.
O = 1.51 " "
N = 120.80 " "

The heat necessary to raise these gases from 60° to 1,800° is the sp. ht. multiplied by the quantity of gas, and multiplied by the rise in temperature, or 1,730°.

Following is the table giving the amounts of the gases, the amount of heat necessary to raise 1 cubic feet 1,730°, and the total for each gas:

Cubic Feet Gas.	Sp. Ht. × Temp.	Total.
28.69 CO_2	62	1,788.78
1.51 O	36	54.96
120.80 N	36	4,348.8
		6,192.54

The total amount of heat necessary to raise the gases corresponding to each pound C. burned is, therefore, 6,192 B.T.U. The analysis of the coke gave 87 per cent. fixed carbon and we, therefore, have .87 × 16.49 = 14.35 pounds carbon per 100 pounds coal carbonized. For the total heat carried up the chimney by these gases we have 14.35 × 6,192 = 88,855 as Item No. 1.

Item No. 2.—The water used to soften the clinker is vaporized at 212° and the steam is then carried out through the flues at the temperature of the flue gases. The heat necessary to vaporize the water and then raise it to 1,800° is a loss, for though the steam may be disassociated into H_2 and CO, and then burned, the heat given off by the burning is exactly balanced by the heat required to disassociate the steam, and the chemical reaction will ultimately give CO_2 and H_2O. To calculate this item we find that 1 pound water per 1 pound fuel is used.

One pound water raised from 60° to 212° takes 1,119 B.T.U., and from 212° to 1,800°	760 "
Total	1,879 "

Giving 1,879 B.T.U. as the amount of heat necessary to raise 1 pound water from 60° to 1,800° F. We, therefore, have for 17 pounds fuel, 17 pounds water, or 17 × 1,879 B.T.U., or 31,943 as accounted for in this operation.

Item No. 3.—The amount of heat lost by being carried off in the ashes as sensible heat is small; in fact, it can be neglected, as the heat of the ashes dropping into the pan heats the water and helps to vaporize it, and that has been accounted for in Item No. 2.

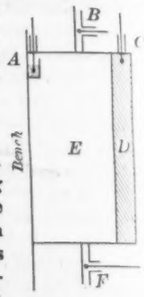
Item No. 4.—The heat carried off by the gas through the mouthpiece and standpipe for each 500 cubic feet gas obtained from 100 pounds coal is found by multiplying the amount of each gas (as determined by the analysis) by the sp. ht. and by the rise in temperature from 60° to the temperature at outlet of retort which I found to be 1,200. This temperature varies from 1,000 to 1,400, but a very large proportion comes off at 1,200. Below is a table giving the analysis of gas, the proportion of the 500 for each constituent, and the B.T.U. necessary to raise 1 cubic foot of the gas from 60 to 1,200:

	Per Cent.	Cu. Ft. in 500 Ft.		B.T.U.	
CO_2	2.2	11.0	×	40.0 =	440 00
C_nH_n	8.4	42.0	×	36.0 =	1,512.00
O	.3	1.5	×	23.6 =	35.40
CO	6.4	32.0	×	23.6 =	755.2
H	50.4	252 0	×	23.6 =	5,947.2
CH_4	27.8	139.0	×	45.2 =	6,282.8
N	4.5	22.5	×	23.6 =	531.0
Total heat carried off by gas					15,503.6

Item No. 5.—The heat carried off by the tar is the weight of tar obtained per 100 pounds coal multiplied by the sp. ht. multiplied by the rise in temperature. The tar amounted to 5.3 pounds per 100 pounds coal. The sp. ht. is 768 B.T.U. for raising 1 pound tar from 60° to 1,200°; this sp. ht. is the figure determined by Euchene. We, therefore, have 53 × 768 = 4,070 B T.U.

Item No. 6.—Heat carried off by the water in the coal. The analysis of the coal gave 2.37 per cent. moisture, and we, therefore, have 2.37 pounds water raised from 60° to 1,200°. One pound raised from 60° to 1,200 requires 1,586 B.T.U.

237 × 1,586 = 3,759 B.T.U.



Item No. 7.—Heat lost by radiation and convection. Radiation is the heat absorbed by the surrounding media, and convection is the heat carried off by the air currents. In determining this loss we use an iron box as per sketch, in which *E* is an air space; *D* is filled with water. At *A* is a thermometer in a mercury cup for taking the skin temperature. *F* and *B* are thermometers in the air inlet and outlet, and *C* is the thermometer that gives the temperature of the water. The skin temperature is determined without the case attached, and then after placing the case on the surface, a stream of air is forced through *E* so as to maintain the skin temperature the same. It is evident that if the space was confined the temperature would immediately rise. The amount of air is measured and its rise in temperature; this gives the heat lost on this area of surface by convection. The rise of temperature of the water, knowing the weight of water, gives the loss by radiation; knowing the surface of the top and front of the bench, we can calculate the total loss. For each 100 pounds coal, the loss from convection was 1,690 B.T.U., and for radiation, 18,971, or a total of 20,661 B.T.U. The bench was one of a stack of 8, and the heat lost at the end of the stack would be divided among the 8 benches. This amounted to only 270 per bench, which is added to the 20,661, making a total loss by radiation and convection of 20,931 B.T.U.

Item No. 8.—Heat carried off by the hot coke. Euchene determined that 1 pound coke at 1,800° carried off 636 B.T.U. Seventy per cent. of the coal charged goes to coke and 17 pounds of this goes back into the furnace and is not lost; we, therefore, have 53 pounds coke as taken out of the bench, which gives—

53 × 636, or 33,708 B.T.U.

Item No. 9.—Heat of formation absorbed. We have seen in Item B that a certain amount of heat is liberated; also that a certain amount was absorbed; this amounted to 3,267 B.T.U. absorbed.

Item No. 10.—We have now the last account to enter. The heat utilized to decompose the coal, that is, the energy necessary to distill off the gas, tar, etc.

We have Items A and B as the heat furnished, and we have Items 1 to 9 as the heat accounted for. If the sum of 1 to 9 be subtracted from A and B, the difference will give us the gross heat energy used in the carbonizing of the coal, part of which comes direct from the coal in the retort. Item 10 thus figured is 51,579 B.T.U. We can now make up our balance sheet, as follows:

Expended.	B.T.U.
Heat from coke	215,623
Heat of formation +	37,992
	253,615

Accounted for as follows:

		B.T.U.	Per Cent.	Per Cent.
1.	Carried up chimney as gases	38,855	35.0	47.6
2.	" " H_2O	31,943	12.6	
3.	Lost in ashes		0	
4.	Carried off by gas	15,503	6.1	9.2
5.	" tar	4,070	1.60	
6.	" H_2O	3,759	1.5	
7.	Radiation and convection	20,931	8.3	
8.	Hot coke	33,708	13.3	
9.	Heat of formation	3,267	1.3	
10.	Balance	51,579	20,3	

The net heat of decomposition would be Items 10 — B + 9, or

51,579
37,992
13,587
3,267
16,854 B.T.U. = 6.6 per cent.

And is the heat of decomposition, furnished by the coke in the furnace, over and above the heat of formation furnished by the coal in the retort.

Discussion.

The President—Gentlemen, you have listened to a very scholarly paper; one that is unusual in its quality, and scientific in its treatment. It is unusual for the greater number of the members to most fully understand just what Mr. Barnum has illustrated so clearly

in this paper. Perhaps, Mr. Storer of the New England Gas and Coke Company may have something to say in the discussion. Is Dr. Wing in the room? Then we shall have to call upon the reliable Mr. McKay.

Mr. McKay—One item here interests me. Of course the net deduction of the whole paper, which has evidently been reached after a tremendous amount of work, is surprising in itself, that only 6.6 per cent. of the furnace heat is actually used in making the gas that we get out of the coal, but in the steps by which this final conclusion is reached the analysis of flue gas is given as 0.1 per cent. and CO 0 per cent. That seemed to me to be pretty good working. I don't understand how it is the author did not analyze directly CO_2 instead of deducing the CO_2 from the analysis as made. I notice also it is asserted that 1 per cent. of oxygen represents 5 per cent. excess air. I think it would be interesting to have Mr. Barnum state his formula for computing the excess air from the percentage of oxygen in the flue gas. Moreover, 5 per cent. excess air seems to be very close working, and I hope we can hear from a number of our members who are making coal gas as to what per cent. of excess air they are able to get along with.

The President—Mr. Barnum, you may answer the question.

Mr. Barnum—Determining the carbonic acid in flue gas is a difficult matter in the laboratory, and to do it in flue gases in a bench is even more difficult. Carbonic acid, of course, is absorbed by water very rapidly. If it is collected over water that water will absorb considerable of it. Even if the water is saturated with the carbonic acid, the water of condensation coming out of that gas (1,800°) will absorb enough of that carbonic acid to cause an error. I have found that from 2 to 3 per cent. is absorbed by the water of condensation. If you determine the oxygen and the CO, and there are no illuminants, as it is very highly improbable that there are, the CO_2 can be calculated from the amount of oxygen which in this case would bring it up to 19 per cent.

Mr. McKay—And your formula for deducing the per cent. of excess air?

Mr. Barnum—If there is 1 per cent. of oxygen, the proportion of oxygen to nitrogen would be 1 to 4, and that 1 per cent. oxygen corresponds to 5 per cent. of air entering the furnace.

Mr. McKay—Then do I understand that the habitual working of your furnaces is satisfactorily accomplished with only 5 per cent. excess air?

Mr. Barnum—That is the best combination to run. It is better and more economical to run an excess of air than to run on deficient air. The amount of heat lost by not burning the carbonic oxide is greater if you have 1 per cent. too little oxygen or 5 per cent. air than the amount of heat lost by heating that extra 5 per cent. air up to the temperature of the flue gases.

Mr. McKay—Item No. 2 states that in which 1 pound of water is used per pound of fuel, and further on that figures out as nearly 13 per cent. of the total heat considered. Has Mr. Barnum utilized the plan which has been evolved in the West, and with which I think perhaps Mr. Cowdery is familiar, under which, instead of using water in the ashpan, or steam, a part of the flue gas is returned beneath the firebed, and in that way, as the inventors describe it, the appetite of the fire for CO_2 is fed from the products of combustion? That of course does not carry to waste anything like the amount of heat represented in this H_2O. Has Mr. Barnum considered that system?

The President—Did you consider that, Mr. Barnum?

Mr. Barnum—Not being familiar with that system, I have not made any calculations regarding it.

The President—Do any other members care to contribute further to this discussion? It is a valuable technical paper.

Mr. Pease—Mr. President, regarding the 1 per cent. excess in flue gas, we have been running our benches without any chemical tests of flue gases for 6 months just by observing whether there was blue flame in the waste flue. After that 6 months we made a chemical test by the Orsat apparatus, and found between 1 and 2 per cent. O, and no CO. We thought that was running pretty close without any analysis of the flue gases.

The President—That is virtually the result that you obtained. How did you come to that proportion without a chemical analysis, Mr. Pease?

Mr. Pease—We had been judging the amount of air we had by simply observing the gases in the waste flue. If a blue flame showed, we judged there was not enough secondary air, that we were getting CO in our waste flues. Then I say at the end of that 6 months we made a test with the Orsat apparatus, and found that we were about right.

The President—Perhaps Mr. Carpenter will contribute to this discussion.

Mr. Carpenter—I am not prepared to discuss this paper to any extent. It would require a great deal of brushing up and work to be able to do it; but it impresses me as being an extremely valuable production, especially on account of Mr. Barnum having confined himself to his particular bench. He has dealt with nothing but facts, and I think it would be a good thing if others would write similar papers, or work this over on their facts, and see how the results check up. The point that impresses me most about the figures is that 12.6 per cent. of heat that is carried out by the water, and the possibility of saving that, which Mr. McKay has mentioned. Mr. Barnum's operation of his producer I think was very nearly normal; he may have been gasifying a little high rate of fuel per square foot of grate area, but I believe that the usual practice in operating such producers and avoiding clinkering by water or steam possibly requires to use more water, if anything, than Mr. Barnum has used; that is, he has probably used nearly all that he could evaporate from the water pan without putting live steam underneath his grate bars. The Germans build their benches with a steam boiler in each setting, so that they can get plenty of it, and keep the clinker down. So that his figure of 12.6 per cent. of heat carried off by the water vapor going up the stack is normal. This would amount to, roughly, 2½ of the 17 pounds of total coke used. It is a big item to save. There is another item which I think goes along with the same saving, and that is the 26 per cent. of carbon in his ash. If clinkering can be practically eliminated, we would get that half pound, which in his particular case at Worcester, with the bench as he was running it, would from these figures amount to 3 pounds of the 17.

Mr. McKay—One other item that is very clearly brought out in the way the figures are arranged is the benefit of feeding the coke hot into the furnace rather than placing it in the furnace after it has been quenched. He has in item No. 8, 17 pounds of the 70 per cent. of coal going back into the furnace, and a total of 53 pounds taken out of the bench, 33,000 heat units accounted for in the hot coke. Seventeen pounds is about 11,000 heat units, and it is worth that much to the manager if it is fed into the furnace direct rather than first being quenched, as is required in some constructions where the furnace is not adjacent to the mouthpiece of the retort.

The President—Are there any other members who wish to further discuss this valuable paper?

Mr. Morrison—If not, I would like to have the pleasure of moving the thanks of the Association to Mr. Barnum.

The Secretary—I would like to second the motion, and in seconding it I would like to express my appreciation of the value of this paper as a contribution to our printed literature, which in the course of time will find its place upon the shelves of our library. In that connection I would like to say that the records, going back to 1897, are now in print. Those of you who have been members in good standing and kept your addresses furnished to the Secretary I presume are furnished with those copies. I would like to say that the Secretary's own office is somewhat encumbered by extra copies, which can be obtained for a consideration by members who have come into the Association since these were printed, and by others who go through the necessary formalities. There are samples of them on the table. I have a few extra copies in my room, which can be furnished on short notice, and should be very glad to send them to parties wishing them.

Mr. McKay—Before the motion for a vote of thanks to the writer is put, there are a great many coal gas and water gas men in the room who must know more or less about how much excess air they are using in the furnaces and in the water gas apparatus. Cannot we get some expression of their findings? It would be very appropriate to have it placed on the record in juxtaposition with this paper.

The President—I meant to convey that same request to everyone. Now I would ask specifically each member here who has any knowledge that is reliable and direct if he will not kindly make a statement of the amount of excess air that it may contribute in a measure in a valuable way to this paper of Mr. Barnum's. When the paper is in print it will be one of reference, and in addition to what has been written the testimony of other people from their own experience would be really of great value.

Mr. McKay—Cannot Mr. Africa give us any information?

Mr. Africa—I cannot give you anything definite. I have not any figures here with me.

The President—It is moved and seconded that a vote of thanks be given to Mr. Barnum for this very valuable paper. [Adopted.] I would refer briefly to the fact that the Secretary has called your attention to a matter that perhaps some ought to avail themselves of. Everyone ought to have copies, and a complete set of these publications. A look into the question box might be in order. The first one I find is:

> "Why do American coals yield so much less ammonia than English and German coals?"

That is a direct question open for discussion. Can anyone tell the proportionate difference?

Mr. Nettleton—I do not know the reason, but I do know that at one time when I was at Leicester, England, Mr. Colson, who stands very high as a gas engineer in England, told me they were producing or could obtain 7 pounds of ammonia per long ton of coal carbonized. In this country I know of only one man who sells as much as 5 pounds per ton.

The President—That is a difference of 40 per cent. What difference have you noticed in your own observation, Mr. McKay?

Mr. McKay—Seven pounds would be a very good yield. I have a few figures here of yield for the year 1904-5. For convenience this has been reduced to terms of ounce gallons, and the usual American yield might be taken, perhaps at about 240 ounce gallons: Bolton, 327; Bradford, 361; Bristol, 354; Bury, 355; Darlington, 328; Dundee, 312; Nottingham, 304; Salford, 355; Sheffield, 370; South Metropolitan, 318; Walsall, 346; Wigan, 459, and in Greenock, 477, or twice as much as we can hope for, on the average. The German coals yield about halfway between the American and the English, and on the ultimate analysis it is not shown why we should not get more than we do.

The President—The same relative strength?

Mr. McKay—Taking it at ounce gallons. That represents total ammonia, by weight.

Mr. Brown—I think there are gentlemen present who used English coal in making illuminating gas 30 or 35 years ago. I wonder if Mr. Coggeshall remembers it.

Mr. Coggeshall—Yes, sir.

Mr. Brown—Was any account taken of ammonia in those days?

Mr. Coggeshall—Not by me.

Mr. Brown—Was it known as to English coal to anyone here?

The President—Not to me. At that time I daresay the ammonia was not saved as it is now. Is there a radical difference between the apparatus used in and through England and Scotland and that used in Germany and the United States?

Mr. McKay—No; practically the principles are the same.

Mr. Norcross—I would like to point out that the ammonia produced at Widnes is higher than that produced at any other place named in the list. The gas in Widnes is produced from slack, and it occurred to me that it may be possible that that slack coal contained more nitrogen to start with than the better grades of coal used by the other people, and in that may lie the explanation of the excessively high production of ammonia.

The President—Do you know the candle power?

Mr. Norcross—The advertisements which Mr. Carr has made of his accomplishments in Widnes have given the candle power as 18, but investigations made by other parties have shown that it is not constantly 18; it is sometimes considerably less.

The President—Are there any other gentlemen who have points of information on this question? Mr. McKay, have the English people any explanation to offer?

Mr. McKay—No, I could learn none. Of course there naturally would be some differences in the heat and time of carbonization, which would make a great deal of difference in the yield of ammonia.

The President—That is one reason why they can sell gas a little cheaper than here.

Mr. McKay—240 ounce gallons maybe, 25 to 30 cents a ton net income.

The President—50 cents. The next question is as to

"The best method of quenching coke?"

Are there any new methods that have been acquired since the last meeting. [No response.]

The President then introduced A. P. Beardsley, Ph.D., of New Haven, Conn., who read the following paper on

THE HYGIENIC EFFECT OF LIGHTING BY GAS.

In studying the effect upon health of the air of rooms in which gas is burned, it will be interesting first to give some attention to the matter of the changes of air in an ordinary room and the influence of gas lighting upon ventilation. This will bring us naturally to the more direct consideration of the composition of the air in gas lighted rooms and the effect of the products of combustion upon health.

It is surprising how often the air changes even in rooms where no special attention is paid to securing good ventilation. Fresh air passes in through the crevices of doors and windows in the lower half of the room, and out through similar openings in the upper half, as well as through fireplaces and chimney openings. Even the walls themselves help in the circulation. Experiment has shown that about 7 cubic feet of air per hour pass in from outside through a square yard of wall when there is a difference of 40° of temperature inside and outside. Prof. V. B. Lewes, of the Royal Naval College, Greenwich, England, found that in a room 10 feet square and 10 feet high, containing a small fireplace, but no fire, and one window and door, which were kept closed, the air changed nearly three times in the course of an hour.[1] This was by ventilation up the fireplace and through the walls and the crevices of window and door. Pettenkofer, a German chemist, found that in rooms of 1,400 cubic feet capacity, with chimney openings, a quantity of air over three times the capacity of the rooms passed through every hour. With every visible chink and crevice except the chimney stopped, this quantity was dimished by only 28 per cent. He also found, in another investigation, that a good stove increased the quantity of air passing through the room by 50 per cent.

The value of a gas flame as an assistant in securing good ventilation is marked. The warmth of the air in a room produces a natural flow upward, and this current is much intensified by the powerful draft created by a gas burner. Even in a closed room a more rapid change of air results, for, as has been noticed, there is a very considerable passage of air through the crevices of such a room. If ventilating openings at the top of the room are provided, an increased circulation results, possibly too much in some weathers on account of the loss of heat. In absence of special openings, however, much the same result may be obtained, and to any desired degree, by opening a window more or less at the top. In most houses, moreover, the living rooms communicate directly with a hall in which is a stairway, which constitutes a very effective ventilating shaft.

Bearing directly upon this subject are the results obtained by Dr. Percy Frankland in his analyses of the air in the Birmingham, England, Art Gallery.[3] This gallery was lighted with incandescent gas lights, provided with ventilators overhead. It was feared by some that the use of gas might cause injury to the pictures and that electric light should be substituted. Dr. Frankland was therefore called upon to test the air of the gallery—(*a*) When no lights were in use, (*b*) When electric arc lights were used, (*c*) When incandescent gas lights were in use. The results he found were as follows:

(*a*) In the absence of artificial illumination, there was a slight increase in the amount of carbonic acid during the day.

(*b*) When electric arc lamps were used, this increase was distinctly more marked.

(*c*) When incandescent gas was used, the amount of carbonic acid was less than when there was no light at all. This showed very plainly the value of gas burners, when properly placed, as assistants in ventilation.

Before leaving this subject, it may be well to notice that the air from the breath rises naturally on account of its warmth. Gas burners are in almost all cases located above the level of the head. They therefore take the air after it has passed through the lungs, not before, and hurry it along directly and positively to the openings available.

Coming to the question of the effect of the combustion products of gas upon health, it has sometimes been claimed that acetylene and carbonic oxide were among these products. Experiments by careful investigators, however, have uniformly failed to show the presence of acetylene. In regard to carbonic oxide, some experimenters[5] have been unable to find any, while others[4] claim to have detected traces. The insignificant amount of the latter is shown by the following calculation: In a room 12 feet wide, 16 feet long and 10 feet high, having 3 changes of air per hour and lighted by a gas jet burning 6 cubic feet per hour, the quantity of carbonic oxide which has been claimed would amount to about 1 part in 3,000,000. As the amount required to produce symptoms of poisoning, even after several hours' exposure, is 1,500 parts in 3,000,000, the matter cannot be considered of importance.[6]

Sulphur dioxide in almost infinitesimal quantities is also produced by a gas burner. During the last three months, New Haven gas has contained an average of 14 grains of sulphur per 100 cubic feet, the legal requirement for purity being 20 grains. If we suppose a room of the same size as before, ventilated and lighted in the same way, this quantity of sulphur dioxide would amount to a little over one quarter of one part per million. Four parts per million is the least quantity that can be detected by taste or smell, and there is no evidence whatever that this amount is in any way injurious. Actual experiment[6] has confirmed the insignificance of the sulphur in the air of gas lighted rooms. Gas containing more than twice the sulphur of New Haven

1. *Journal of Gas Lighting*, April 13, 1897, page 846.
2. *Journal of Gas Lighting*, July 29, 1902, page 276.
3. *Lancet*, Jan. 5, 1895; *Journal of Gas Lighting*, Nov. 19, 1895, page 1024.
4. *Journal of Gas Lighting*, Nov. 24, 1903, page 475.
5. *Journal of Gas Lighting*, Oct. 16, 1900, page 948; also "Report of Departmental Committee—Water Gas—English Government Blue Book," 1899.
6. *Journal of Gas Lighting*, Sept. 6, 1904, page 672.

gas was burned in a room about 10 feet square and 10 feet high, care being taken to prevent natural ventilation as far as possible by puttying the cracks of doors and windows and varnishing the walls. The test was made in London, where the outside air contains vastly more sulphur than the air of our cities Nevertheless, the maximum amount of sulphur dioxide obtained was about one-half of one part per million.

A cubic foot of gas such as is supplied in New Haven requires for its combustion the oxygen contained in 6.02 cubic feet of air and forms in burning .82 cubic feet of carbonic acid and 1.15 cubic feet of water vapor. A flat flame gas burner consumes about 6 cubic feet an hour. A Welsbach burner gives about three times the light with a consumption of 3.5 cubic feet per hour, a little more than half that required for the flat flame. It is thus seen that flat flame burners produce $6 \times .82 = 4.92$ cubic feet of carbonic acid per hour and a Welsbach burner $3.5 \times .82 = 2.87$ cubic feet per hour.

Regarding the amount of carbonic acid in the human breath, probably the most accurate figures are those obtained in the respiration calorimeter experiments which have been conducted at Middletown, Conn., by Prof. W. O. Atwater, assisted by Prof. Rosa and Prof. Benedict.[1] These men find that the amount of carbonic acid exhaled varies greatly according to the amount of work a man is doing. A man sleeping produces about .48 cubic feet per hour, one exercising moderately about 1.90 cubic feet, and one performing very severe exercise about 4 cubic feet. In the ordinary living room a man seated will exhale about .76 cubic feet of carbonic acid per hour. In addition, organic matter of bad odor is also evolved both by the lungs and skin.

In estimating the amount of carbonic acid ordinarily present in a living room, let us again suppose a room 12 feet wide, 16 feet long and 10 feet high, in which three people are sitting. The room is lighted by a Welsbach burner overhead, which will give as much light as three ordinary burners or three and one half 16-candle electric bulbs. It has been said before that with a room shut as far as doors and windows are concerned, but with a fireplace, the air changes about three times per hour. It may be mentioned in passing that these experiments were conducted abroad, where the fireplaces are not nearly so large as our own. With doors open to the hall, or with the windows slightly open at the top, the gas would certainly produce a better ventilation than three changes per hour. However, let us calculate on this latter figure. The air of this room would then contain 11.95 parts of CO_2 in 10,000, of which 3 would be that always present in fresh air, 5 that produced by the gas, and 3.95 that produced by the people. Just here a word in anticipation. While the carbonic acid produced by gas is the same substance as that produced by persons, the indication it affords of the fitness of the air for breathing is not at all the same. This point will be explained later. Prof. R. C. Carpenter, of Cornell, gives 8 parts of carbonic acid in 10,000 as a standard of good ventilation, but this figure, as will be understood later, is to be referred to the carbonic acid produced by people plus that always present in fresh air. In the above case the sum of these 2 is 6.95.

An actual test along this line has been made by the same Professor Lewes before mentioned. He experimented with a sitting room 12 feet long, 16 feet wide and 12 feet high. The room had a door and a window which were kept closed, and a fireplace. It was lighted by three 7-foot, flat flame burners, and occupied by two people. The air in this room, closed tightly as said, changed 14 times in 5 hours, and at the end of that period Professor Lewes found only 21 parts of carbonic acid in 10,000. As stated, 3 large burners were used in his case.

It is to be noticed that the carbonic acid produced by burning gas is accompanied only by water vapor and some insignificant amounts of sulphur compounds. The carbonic acid from human beings, however, is accompanied both by water vapor and organic impurities from the lungs and skin. This is an important fact, because, startling as it may sound, carbonic acid itself has no poisonous or injurious effect upon the system. Regulations as to the amount of carbonic acid permissible in the air of a room are made because it is found that the organic impurities and the carbonic acid given off the body bear a regular proportion to each other. It is difficult to directly determine the amount of organic impurities present, but if the amount of carbonic acid is learned, the organic impurities are known by inference. The statement that carbonic acid itself is not at all harmful is of course contrary to the older belief, but it is the conclusion of the best investigations. Among these may be mentioned the researches of Pettenkofer, the report[2] of Drs. J. S. Billings, S. Weir Mitchell, and D. H. Bergey to the Smithsonian Institute, the report[3] of the British Departmental Committee to consider the ventilation of factories, and last and most important, the results of the experiments with the respiration calorimeter at Middletown, Conn.[1]

The men who are the subjects of these latter experiments live uninterruptedly for days in an atmosphere containing never less than 27 parts of carbonic acid in 10,000 or 9 times the amount in fresh air, and usually much more; sometimes as much as 225 parts per 10,000, or 75 times normal. In not one case has any ill effect been observed either during the experiment or at any time afterwards, nor have numerous blood counts shown any anaemic tendency. The men feel in regular health and are perfectly unaware from any sensation of the great amount of carbonic acid present. It should be mentioned, however, that the air is dried before being supplied to the men. Professor Benedict, who conducts the experiments, told the writer that it was impossible, even under the worst conditions of ventilation, to produce in a room an amount of carbonic acid which in itself would have an ill effect.

It appears, then, that we may not attribute a sensation of close or bad air in a room to an excess of carbonic acid. Authorities tell us also that any ordinary diminution of the per cent. of oxygen present cannot account for it.[2] The cause seems to be something quite different. Professor Benedict, in common with other investigators, lays it to three factors. The first, though not the most important, is unpleasant odors. The effect of these is mental rather than physical, but very real nevertheless. But the two most important causes of closeness are high temperature and excessive moisture, particularly the latter. Temperature and moisture are related to each other in the fact that with a high temperature more moisture is allowable and necessary than with a low temperature. A certain balance between the two, or a per cent. of saturation, is necessary for health and comfort. The removal of moisture from the body by insensible perspiration and by the breath will be unduly hastened or hindered, as the case may be, according as there is a lack or an excess of moisture in the air. An excess of moisture, however, appears to be most often responsible for discomfort.

Since water vapor is one of the products of the combustion of gas, we are at once met by the question, What is the effect of gas lights upon the moisture in a room? A certain amount of water vapor, as said, is necessary for health and comfort. Authorities say about 50 per cent. of that required to produce saturation of the air is the proper amount. It is only in the summer time that the air of our houses, as drawn in from outside, contains that amount. As soon as fall comes and the furnaces are started, the usual complaint is of the dryness of our rooms, and water is purposely evaporated to supply the lack. It is only in the summer, therefore, that the moisture from the gas flame would be undesirable, and in the summer time our houses are as open as it is possible to make them. With air pouring in through every door and window, the moisture added to the air by a gas flame is indistinguishable. During the rest of the year, the addition of moisture by gas is not only not an annoyance but a benefit.

In conclusion, it may be said that it is anything but the object of this paper to undervalue the importance of good ventilation. That is a matter of which experience has shown the necessity, irrespective of the question of lighting. It does appear, however, that efforts to show the poisonous character of the products of the combustion of gas lack corroboration by the best scientific investigations, and it is in the effort to present a few of these facts that this paper has been undertaken.

(To be Continued.)

1. "Year Book of U. S. Dept. of Agriculture," 1904.
2. "Smithsonian Contributions to Knowledge," Vol. 29.
3. "Government Blue Book," 1904; also *Journal of Gas Lighting*, Nov. 25, 1902, p. 1398.

[Abstract.—Continued from Page 538.]

FIFTH ANNUAL MEETING, WISCONSIN GAS ASSOCIATION.

Held at the Hotel Pfister, Milwaukee, Wis., Feb. 14–15, 1906.

Second Day—Morning Session.

Mr. I. F. Wortendyke here presented the following

Report from Committee on President's Address.

Milwaukee, Wis., Feb. 15, 1906.

This Committee wishes to heartily indorse the attitude of our President in regard to the socialistic tendency of the times, and wishes to bespeak the earnest co-operation of every gas man in Wisconsin to give the public correct views in this matter.

We recommend that, in order to secure unanimity of action by the

1. "Year Book of the U. S. Dept. of Agriculture," 1904.
2. "Smithsonian Contributions to Knowledge," Vol. 29.

gas companies of our State, a Committee of 5 be appointed by the President, he to be Chairman of such Committee.

I. F. Wortendyke, J. A. Patten, Edward Daniell, } Committee.

[Adopted.]

The President—Has the Chairman of the Question Box Committee any special report to make outside of the answers to these questions?

Mr. Haase—No, sir.

The President—Has Mr. Walker any report to make as Chairman of the Wrinkle Committee?

Mr. Walker—Yes, sir.

The President—Perhaps we had better take that up later. Has Mr. Kimball, Chairman of the New Business Methods Committee, any report to make?

Mr. Kimball—I have a report to present on behalf of the Committee on New Business Methods. It was not specified exactly what was wanted, so I asked different members of the Committee to give me a written report of what methods had been pursued in the different towns during the last year in getting new business, and these reports are as follows;

Report of the Committee on New Business Methods.

The Committee on New Business Methods, consisting of myself as Chairman, Mr. F. J. Rutledge, of the Milwaukee Gas Light Company, and Mr. Wm. Wallens, of the Oshkosh Gas Light Company, submit herewith the following report:

When this Committee was appointed no specified lines for each report was given, so the Chairman asked each member of the Committee to submit an individual report giving the methods pursued and the experience of each one in their respective towns.

In Kenosha during this last year, on account of the fact that we did not have sufficient holder capacity, we did not push our gas business as much as we have formerly done; and having a new electric plant, which was underloaded, we spent most of our time in increasing this business. It is quite difficult, in running a combination gas and electric plant, to know just how far to push the gas without competing with the electric; in other words, doubling up our investment to take care of the business. We have increased our electric plant business about 100 per cent. this last year by confining our attention to decorative lighting and motor business, which does not in any way compete with the gas department.

In the gas department we did not lay any new mains, but confined our attention to getting what business we could on the existing mains. The success in getting new business is not so much a matter of any particular system, as it is a matter of aggressively pushing any system which may be adopted. A great many of us go to the Association meetings and theorize as to how new business should be gotten and let the new business department take care of itself. We have used newspaper space for advertising consistently, but I find it very hard to check up the results of the money spent in this way. We use stickers sent out by the manufacturers, and also send out cook books and other advertising of this character.

We are of the opinion that solicitors are the best method of getting new business, but they are difficult to obtain and difficult to be kept busy to the best advantage, unless the company is large enough to have a man whose sole business it is to look after them. The payment of solicitors is quite a problem. We started out to pay the solicitors so much per stove and illuminating consumer. We find this not very satisfactory, on account of the fact that they make good money in the spring, and get tired when business does not come in so rapidly later in the summer and fall; also, they are not interested in anything but getting new consumers. We then tried guaranteeing them a salary of $40 per month and 20 per cent. commission on the sale of stoves, fixtures and appliances. We then found our solicitors selling Welsbach burners and merchandise without getting any new business. We then hired our solicitors, paying them a monthly salary and keeping them the whole year round, impressing on their minds that the primary object was in getting new and profitable business; also, to take care of any complaints and trouble that they might hear of. We found this method of taking care of our solicitors the most satisfactory one we ever tried.

From January until the 1st of March we have them devote their attention to illuminating work and dead services; that is, services that are in the houses but not in use. During the summer their time is devoted to stoves and water heaters, and in the fall putting fixtures in new houses. In November and December we use them mostly in our electrical department.

We have a card system on which the solicitors make out a report of everybody they call upon.

In looking back over the past 5 years we find we have changed our system every year, and the biggest element of success or failure is not the nature of the method but the way it is pushed.

Brief Outline of the Methods Used by the Milwaukee Gas Light Company in Securing New Business.

The new business department of the Milwaukee Gas Light Company is itself divided into several parts, and is composed of the representatives, burner men and stove repair men, each division having its own particular class of work to do, yet all working together in a systematic way with one object in view, to increase the sale of gas, and to hold the business which we already have. At the present time the Company has 20 men, known as representatives, whose duty it is to settle any or all complaints turned over to them; to look after the interests of the Company, and to do everything in their power to promote a friendly feeling between the Company and its patrons. These men are also expected to obtain new business and are supposed to be well informed on all lines pertaining to the domestic fuel, power, industrial and lighting business. Each representative is given a certain district in the city to look after, and is held responsible for all the Company's interests in that territory. These districts are so divided that each one has a residence portion as well as a business and factory section, consequently all the men thus have a certain class of business which they can work upon at all times during the year.

The representatives are sent out for the express purpose of selling gas, and their salary depends not only on the amount of gas which they dispose of, but also according to the investment which is required to take on the new business. This system of payment has been in operation for nearly a year, and has proved to our satisfaction that it is the most equitable basis yet discovered by which we can pay our men.

It is impossible to set an arbitrary value on any man's work in this class of business. For instance, one will bring in a large amount of business without any apparent exertion, and seem to be satisfied that he is earning his salary. Perhaps another man would work a great deal harder than the first, and yet not turn in the same volume of business. Again, a third man might come along with about the same amount of business as the first, but more valuable, as it required a smaller investment on the part of the Company.

Now, if each of these three men were getting the same salary, the first man would not be doing all that he was capable of, the second would be getting too much money, while the third would not be paid what he was worth. At the same lime, your first man takes it easy, thinking he is doing enough to earn his money; the second is simply striving to keep up with the other two, while the third is dissatisfied and knocks the first man.

This condition is not possible when each man receives, in addition to his salary which is paid for routine work, a certain additional compensation which is determined by the actual volume and value of the business he turns in. This system is better for the Company, because this way it pays for actual returns. At the same time it is better for the representative, because he gets just what he is worth, and it all depends on his own efforts.

There is all the difference in the world in the two ways of sending a man out to get business. If you are paying him a straight salary, it is necessary to use a great deal of diplomacy and pushing to get your money's worth out of him. He will go out on his territory in a more or less disinterested, listless way, and will be liable to quit a little early, if he doesn't feel just right, or he may succeed in landing a good order some day, and then think that is enough.

Under this new system of payment, all conditions are bettered. You can send a representative out in the morning with a determination to put in a full day at good, hard work, because he realizes that the more business he secures, the greater will be his reward when "The ghost walks."

A man is practically in business for himself, and will naturally have a greater interest in the welfare of the Company when he understands that he is responsible for everything that goes on in his own territory, and will be much more careful in the way he handles the consumers.

There is a very noticeable difference in the attitude of the men toward the Company and each other. Now, each one knows just how much he is worth, and it is up to him whether or not he is satisfied. It also does away with the petty jealousies and knockings which are bound to come amongst a crowd of 20 men, when each is receiving a fixed salary.

It is absolutely necessary for each man to have a thorough knowl-

edge of the business. He must be able in every case to estimate and compare the initial investment with the returns therefrom, and accordingly devote his time and energy in securing that class of business which will be most valuable to the Company, and consequently to himself.

The representatives hold a meeting every morning at 8 o'clock, at which time general instructions are given, also special information as called for, and general discussions engaged in. This brings out an exchange of ideas, and the methods used by different men in overcoming obstacles that have arisen in their previous day's work.

All special sales of general interest are reported and discussed by the representatives who closed the deal, so that all may have the desired information in case some other man has a prospect for a similar installation.

These half-hour meetings are very beneficial, but there is not time to discuss any one subject thoroughly, so we have organized a club which meets Monday evenings, at which time we can take up special subjects more carefully. The membership includes all representatives, burner men, stove repair men, application and complaint men.

At these meetings different appliances are demonstrated and discussed, so that each man will become thoroughly familiar with their different uses, and qualified not only to instruct old consumers in the use of gas but to talk intelligently to prospective consumers.

These Monday night meetings are very beneficial to the Company, in that they bring together practically all the men who are in constant contact with its consumers, giving them the information necessary to use to educate the public in the proper use of gas.

The uses of gas are so varied that it is impossible to get any one representative who would be an authority in all lines, so we have several special men whose duty it is to supply technical information and assist the representative in every way possible to secure business which he could not otherwise obtain.

Our industrial man spends a great deal of time with the representatives in looking up prospects and helping to close them, sometimes only after a special appliance has been made up to accomplish the desired results.

The special engine man's chief duty is to inspect the gas engines which we have in operation in the city and keep in close touch with all this class of consumers, in order to adjust any little difficulties they may have and advise them in the care of the engine itself. He is also of great value to the representatives, inasmuch as he is able to furnish data which enable him to close business with new consumers.

One of the greatest helps to the representatives is our "Information Bureau." The man in charge furnishes lists of services not in use, lists of meters which show low consumption, lists showing consumers of fuel or illuminating gas only, and any other information which will enable the representative to find our best prospects at once. This department also keeps a strict account of all the business turned in by each representative, and makes a weekly report, showing the investment required to take on the business which they have closed.

The Company is always anxious to secure all the new business possible, but a proposition much more important is to get the full value from investments already made; in other words, to keep its present consumers so well satisfied that they have no inclination to discontinue our service. With this object in view a burner department was organized, enabling us to take contracts to maintain lights, thus assuring consumers good service at all times. This department is invaluable to the Company, for it accomplishes a two-fold purpose. We are putting out among our consumers trained light men by whose constant efforts the lighting conditions in the city have wonderfully improved. A great deal of prejudice against a gas company is traceable to dirty and inferior burners, and too much cannot be said of the value of this method of looking out for our own interests.

These burner men are creating a demand for gas when they keep a merchant's light in such a condition that his neighbor takes notice and begins to figure on a similar installation. Often the burner men find good prospects and then turn them over to the representatives to close. With exactly the same object in view, we have inaugurated a stove repair department to which we refer all complaints of stoves out of order. Competent men are sent out to remedy difficulties or report to the representatives when new appliances are needed.

We also have demonstrators or, strictly speaking, inspector demonstrators, whose duty it is to inspect all new ranges set, and instruct consumers in the proper and most economical way to use them. These inspectors also call on old consumers whenever the representatives or stove men discover that the operation of a range is not thoroughly understood, or not being used to the extent which it should be.

A special advertising man is employed to look after the publicity end of the business from the printed standpoint. He keeps in close touch with the various departments of the Company, carrying on a vigorous campaign by the use of stickers on the gas bills, readers and display "ads." in the newspapers and circular letters with return post cards mailed to particular prospects which we are anxious to secure. These prospects are taken from call cards turned in by the representatives and, therefore, we can direct our advertising in an inexpensive and intelligent manner.

In fact, the whole question of securing new business can be summed up in a very few words. First, use system; use system in solicitation, system in keeping records and system in *everything*. Be perfectly honest with everybody, believe absolutely in what you are selling, and then go after the business with all the tact and enthusiasm you can muster.

OSHKOSH, WIS., Feb. 7, 1906.

My dear Mr. Kimball: I have your favor of the 25th ult., and note what you say. We have been laying low in Oshkosh for 2 years past. No new mains have been laid. We had a solicitor all last summer, and he worked the old mains as hard as possible. We put out 135 stoves and secured, in addition to these fuel consumers, about 300 illuminating ones, as well as placing fuel appliances of different styles, such as hot plates, water heaters, both instantaneous and independent, and a few automatics. Also gas logs, gas grates, etc.

Our proposition for last summer was simply a renewal of our proposition of 3 years past, which is as follows: For $10 we piped 3 adjoining rooms for illuminating purposes, and furnished a 3-light, 2-light, and a 1-light chandelier for same, and made service connection. For $26 we made the same proposition as above, plus the furnishing and connecting of a gas stove all ready to use. We accepted installments in payment of the amounts, or gave them $1 discount for cash, if they so chose.

I do not think that our proposition will be new to the members of the Wisconsin gas fraternity, however, if you think it will prove good to any member of our Association, I shall be glad to do anything that I can to help our Committee.

I am not sure that I will be in Milwaukee during the first day, but expect to attend the dinner and have reserved a ticket for same. I will look you up when I get there, and see if there is anything I can do.—Yours truly, WM. WALLEN.

An adjournment was ordered to 2 P.M.

SECOND DAY—AFTERNOON SESSION.

The meeting reconvened pursuant to adjournment. The session was commenced by

ANOTHER TRY AT THE QUESTION BOX.

The President—Question No. 8 is:

"How often should newspaper advertising copy be changed, and why?"

I will call on Mr. Kelsey to answer that question.

Mr. Kelsey—I think it should be changed with every insertion, for the reason that if you use any sort of advertising medium, for the sake of getting the attention of the people, and if your copy is strong enough, it should not only attract the attention of the casual reader, but the regular reader of the paper; and whether you make it strong, by illustration or change of type or new text, you are going to increase the chance of getting the attention of the regular reader.

Mr. Douglas—It appears to me the regular reader you have already. Now, you want to secure the man that had never thought about the proposition before. I am reminded of the advertisement of Uneeda Biscuit, where they keep pounding at that one idea all the time, and it is the best advertisement that the American Biscuit Company has, and they cannot overdo it. So I think for instance that the expression "Cook with Gas" should be kept continually before the people. We do not want to change too much. There is effect in repetition. It seems to me these matters should be left to the judgment of the advertising man. If you have a good strong advertisement, work it; if you have a poor one, cut it out. I would pound a good "ad." hard. "Uneeda Biscuit" will never die. "Cook by Gas" should be immortal.

Mr. Kelsey—Surely the phrase "Cook with Gas" to my mind should go into every single advertisement you put out in type, strong enough so that it will predominate; but you are going to get just as strong an impression from the casual reader by the same "ad." that will attract the regular reader, by virtue of being new. The National Biscuit Company "ad." is changed almost every day. The salient features, of course, remain.

The President—Question 9, which is

"Is metallurgical coke securing a footing anywhere as domestic fuel? What are the arguments against it for this purpose?"

I will call on Mr. Gregg to answer that.

Mr. Gregg—In the first place I think it would be well to divide metallurgical coke into three classes to cover the different kinds of that coke coming into this district in competition with gas coke. First, the Connellsville coke, either 48 or 72-hour; second, the Hamilton, or Otto process coke; third, the Semet-Solvay coke. There has never been as far as I know any great amount of Connellsville coke used

through the Northwest as a domestic fuel. The only places I know of at the present time are a few suburban towns north of Chicago and Madison, Wis. We have already displaced some of this coke at Highland Park and Lake Forrest, where dealers have persuaded consumers to try gas coke, and they have since advised me that after learning how to burn it properly it has been found more satisfactory than the Connellsville coke. At Madison there are quite a number of professors at the University who believe the best results can be obtained from Connellsville coke. Like all professors, if they can figure it out in theory that settles it, regardless of the results. So far as Hamilton coke is concerned the few cars which were shipped into Wisconsin last spring were found unsatisfactory. Dealers are advising me at several points that their customers were unable to burn it at all. The Solvay coke seems to be a different proposition, being more adopted for domestic purposes when crushed to small sizes than other metallurgical cokes. This coke has made considerable progress since its introduction into this territory. It was advertised very extensively, the Milwaukee Company having at one time 5 salesmen on the road and the coke was introduced with better success at points where there were local coal gas plants than anywhere else. I think the reason why Solvay coke was introduced so extensively in towns with local gas plants was on account of the fact that the local gas plants very seldom make any arrangements with the dealer whereby they can handle their coke. They were, of course, ready to take up a new kind of coke for which they could ask a higher price, and one reason why they could do this was because Solvay coke was screened to sizes. When we discovered this fact and took it up with the dealers at these points we have been just as successful in selling them our coke. The Solvay argument had been at all times that their coke is much superior than gas coke on account of being harder. They have gone so far as to claim that it contained more carbon than hard coal. One advantage this coke has over gas coke is the fact on account of being harder and it does not absorb as much moisture in the quenching. This adds to its advantage from the dealers point of view. Solvay coke seems to work fairly well in furnaces, but not so well in open grates, small furnaces, stoves and kitchen ranges. It does not light so readily and will not hold the fire so well. One argument against hard coke for domestic purposes is that it requires more draft to burn it than gas coke and is, therefore, harder on the grates. Outside of Solvay coke I do not think that metallurgical coke is making any progress as a domestic fuel and there is no question but that gas coke has made greater strides and been introduced into more territory this season than any other coke. We have numerous letters on file from dealers who have tried Solvay coke and who have come back to us assuring us that in their towns at least gas coke is preferred by their customers. I suppose that Semet-Solvay coke could, strictly speaking, be called a metallurgical coke, and if it is considered so I think the question will have to be answered "yes," that it has made a great deal of progress in this district.

The President—What cokes do you classify as being metallurgical—do you mean all coke outside of gas house coke?

Mr. Gregg—It is supposed to be any coke which is used to melt metals with. Of course, Semet-Solvay and Codnellsville cokes are used for that purpose.

The President—How does the coke manufactured by the Otto-Hoffman process compare with that manufactured under the Semet-Solvay process? Wherein do they differ?

Mr. Gregg—I do not know exactly what the technical difference is, but what little Hamilton coke has been shipped into this district has been found very unsatisfactory.

Dr. Harrop—How about the Duluth coke?

Mr. Gregg—It is practically the same as Hamilton. The output, I believe, is handled by the Northwestern Fuel Company, and I ran across it in Minnesota. It was unsatisfactory; in fact, the Northwestern Fuel Company is buying coke from us here; so that there must be trade of its own to whom it cannot sell its product.

The President—We should be glad to hear from Mr. Bredel on this subject.

Mr. Bredel—I do not know that there is any difference between the Otto-Hoffman and the Solvay coke. It depends on what coal is used. If you try to use a gas coal in the Hoffman oven and make a metallurgical coke out of it you will fail, while if you use coking coal, you will get something near to the Connellsville. It is not so much a question of what oven is used, but how the oven is handled and what the coal used for carbonizing is. Coke made in Connellsville is made out of coking coal and not out of gas coal, and if they tried to use gas coal they would not get that silvery coke they get out of coking coal.

The President—What is the difference between coking coal and gas coal?

Mr. Bredel—Coking coal has less hydrocarbon. It runs higher in carbon, and would be valueless for the purposes of gas manufacture. Of course, there are naturally intermediate grades, but you have never heard of Connellsville coke being used for the manufacture of gas.

The President—How low a grade of coal, in your opinion, could be used as a coking coal?

Mr. Bredel—That depends on the oven. For instance, they have German ovens which use as low as 66 per cent. of coking coal and 33 per cent. of cindering coal. But this is a continuous working oven, where the coke is under tremendous pressure. The coal is mixed and fed into the oven and the rams applied and pushed forward slowly. Then the ram recedes; then another charge is put in and pushed forward again. In that way they can make metallurgical coke out of ⅔ coking coal and ⅓ cindering coal, or what is generally called steam coal. Then the product is taken out at the other end. But such ovens are not in existence in the United States.

The President—Do not those two coals separate after they have become coked?

Mr. Bredel—No, sir; they are thoroughly mixed and form metallurgical coke—it is a very nice coke, and I have seen it produced in Germany. Such ovens are naturally only used where the coal mines have an amount of slack coal that they cannot get rid of at suitable prices. I want to mention here that the rule in Europe is to put the coke oven where it really belongs, namely at the mine. Coke ovens are put in other places in this country, because of discrimination on the part of railroad companies as to rates on coke and coal—otherwise that would not be done. As you know, I have used both the Solvay coke and your coke at home, but I find that both cokes require an ashpan filled with water to save the grate. If they do not do that the grate will certainly be burnt out in both cases, no matter which coke is used.

The President—You would not entirely agree then with the statement of our advertising department that it is simply a question of regulation of draft that preserves the grate?

Mr. Bredel—I do not know but that if you had a fine kitchen servant or an expert to regulate the draft it might be done, but you do not find that generally; you have to take the labor you can get.

Dr. Harrop—I would like to add to what Mr. Bredel has said about his furnace requiring water in the ashpan my own experience. He has made the statement that neither the Milwaukee gas coke nor the Semet-Solvay coke will burn in the furnace without clinkering unless he has water in the ashpan. Now I think he ought to modify that statement to read that he cannot burn Milwaukee gas coke or Semet-Solvay coke in his furnace without clinkering unless he uses water in the ashpan, because it seems to me that it is entirely a question of temperature. If his furnace were big enough, so that he did not carry such a high temperature, then he could burn either coke without very much clinkering at least, just as the rest of us do.

Mr. Bredel—I do not think I said anything about clinkering, did I?

Dr. Harrop—You did not use the word clinkering, but you said you burnt out the grates. Can you burn out a grate without forming clinkers?

Mr. Bredel—A mechanical grate can be burned out very easily, and the way the grate is burned out with coke is through a little carelessness on the part of the stoker, letting hot ashes drop under the grate. I am speaking about mechanical grates now. The grate gets so hot that it burns out, while if the ashes drop in water it does not.

Dr. Harrop—I think my point still holds. I use at home a furnace with a mechanical grate, and this winter at least (to be sure, the weather has been quite mild) I have been able to heat the house with a very slow fire—in fact, I kept a bed of ashes right on the grate bars at all times, and did not use any water in the ashpan, so that from my standpoint it is true that you can burn coke in the furnace and heat your house without using water in the ashpan and without burning the grate.

Mr. Gregg—One reason why our gas coke is superior to the Solvay coke is because it does not require as much draft to burn it as the Solvay does, and practically at all times of the year (except in the coldest weather), you are able to keep ashes between the grate and the fire. It requires little draft to keep up the fire, and there is no reason why the grate should be burned out. We have received a testimonial from a lady who burned coke in the same stove for 6 years, and she says as far as she can find out it has not injured her grate in any way at all.

Mr. Bredel—Please remember that I said "When the grate is handled by any labor we can get, and not by experts." Most people do not watch their own fires, but hire someone to do it, and this help is often inefficient and careless, and you have got to have something that is foolproof. To put a pan of water in there does not cost much, it can be put in any furnace, and it is a valuable preventive of destruction of grates.

Mr. Douglas—I am sorry to disagree with my esteemed friend, who as a rule is the best posted man on the gas business I have ever met; but I have been using coke in my house, in a hot air furnace, for 6 years steadily—used nothing else—and the grate is as good to-day as ever. I never let anything like a red hot ash drop through that grate, but there is always a layer of ash on its top. We do not use any water, and the servant who is handling the grate to-day, and during this winter, is a girl who came from Norway a short time ago and is 20 or 21 years old. She cannot speak English, but she can take care of that grate all right.

The President—How did you instruct her as to the leaving of this deposit of ashes over the grate?

Mr. Douglas—Don't take your ashes out, and there is absolutely no trouble.

Dr. Harrop—Did you show her that in English or Norwegian?

Mr. Douglas—I made her understand it. (Laughter.) Now, with regard to clinkers? What is clinker? Nothing but melted ashes. You cannot have a clinker unless you raise the temperature to the heat necessary to melt the ash. With a soft fuel like gas coke you do not have to raise your temperature high. But, as explained by Mr. Gregg, the harder your coke the greater the temperature necessary to burn it, and the tendency to clinker, therefore, goes with the harder coke. You take an old beehive oven, which is 6, 7 or 8 feet across, and put in your coal, and you have to give it time, otherwise you will have part coke and part coal, and some between—it takes time—and the very method of making that coke makes it hard. Our method makes a soft gas coke. It is more friable. There is no doubt that gas coke is the best coke in market for domestic uses, and there is no trouble with it whatever.

With regard to grates, whether mechanical or fixed, if you will pay attention to them you will have no trouble. Gas coke is a metallurgical coke, if you choose to use it as such, and a good one. I have sold thousands of tons for smelting raw ore into pig iron; it does good work; and I have also sold thousands of tons of coke to foundrymen for making ordinary castings, and it will do it.

Mr. Gregg—Of course it is a fact that gas coke can be used for metallurgical purposes, and we are selling it for such purposes; but as I understand it, that term is used for melting iron particularly. Now we are selling practically all the malleable iron companies, and firms like the Allis-Chalmers Company here, for their core ovens, but they cannot use this gas coke for cupola work. They can use it for brass furnaces, drill furnaces and forging work, but as I understand, it cannot strictly speaking, as I say, be used for cupola work.

Mr. Eastman—I do not think you would have any trouble using gas house coke in a foundry or cupola, if you cut your blast down. The harder the coke the harder the blast, the softer the coke the milder the blast.

Mr. Bredel—When I spoke about metallurgical coke, I referred to coke ovens. The old beehive oven is a very different proposition. Metallurgical coke is generally understood to be coke of such density that the iron which is thrown in the blast furnace, together with lime, will not crush the coke. Soft coke would be immediately pulverized by the weight of the iron itself, and you could not get blast enough on to burn it. You might just as well throw powder into the cupola.

Mr. Walker—Mr. Bredel's position in the burning out of the grates I think is perfectly correct, but I do think that he forgot to qualify it by saying, "If you leave the ashes under the grate." I think a good deal of discussion has been precipitated by his leaving that out. I have used coke in my house for 10 years. We have changed the grate once in that time. That same grate would probably be in use to-day if not for the fact that I neglected to take out the ashes one morning, and was too sleepy to take them out at night, and the next morning the grate was down. But that grate had been in use there for 7 years before that, and was getting rather weak anyway. Keeping water under the grates is certainly a very good idea, but really impracticable in a household, for the reason that if you are running your fire very hard in the winter time in cold weather it evaporates very fast, and would require such constant attention that it would take up altogether too much time, and would be neglected. But as far as the burning of gas coke in a furnace for the heating of a house is concerned, I think that can readily be done without danger of burning out grates, without trouble, and without calling in an expert.

(To be Continued.)

Some Notes on Gas Fires, from a Consumer's Standpoint.[1]

By Mr. F. H. Leeds, F.I.C.

For the purposes of the present article, gas consuming apparatus intended for the warming of apartments may be loosely divided into three classes—(1) the so-called condensing stove, (2) the apparatus with concealed luminous flames and a metallic reflector, and (3) the gas "fire" with atmospheric flames playing upon some appropriate refractory material. Both of the latter are, or should be, connected with a flue for the escape of all combustion products. Only stoves of the last variety are referred to in the following lines—partly because the writer prefers them and has most experience with them, and partly because at the present time they are probably most popular. Technically or economically, there is no doubt that the gas fire ranks below the condensing stove, and perhaps it is also less efficient as a means of utilizing the latent heat of gas than the reflecting stove; but in a matter of the present kind strict efficiency must be relegated to a position of second rate importance whenever, or if ever, it comes into conflict with hygienic value or comfort. For various reasons which it were futile to enter upon here, the open coal fire is still to be found in the dwelling rooms of the average private house; gas warming appliances being employed in bed rooms and sitting rooms which are only occasionally occupied. Inasmuch as the gas fire is used, or tends to offer itself for use, mainly in the bed room, it brings itself very largely under the notice of the invalid and the doctor; and its behavior has to be judged more strictly as a hygienic piece of heating apparatus than the coal fire in the dwelling room. The occupants of the dwelling room undergo daily exposure to the open air, and their state of health renders them comparatively immune to defects in the heating apparatus; but the invalid frequently lives months at a time in a gas-warmed atmosphere, and feels very acutely (objectively, if not subjectively) small vitiations in the air.

The foregoing explanation is offered as a reason why the gas fire is now being studied from a somewhat specialized aspect, as part of the contents of the invalid's chamber. There is nothing unfair in this. The combustion products of a well designed gas fire may be hygienically regarded as consisting of highly diluted sulphurous oxide, which it is harmful even to the most robust person to inspire. A quite considerable proportion of the middle aged belonging to the middle classes of society, who are the chief consumers of gas, when their health is indifferent during the winter months, suffer from affections of the bronchial organs of a bronchitic or asthmatic kind; and it is perhaps not commonly known that the breathing apparatus of this variety of semi-invalid, more especially the asthmatic, forms as keen a qualitative test for the presence of sulphurous oxide as any reagent the chemist can apply. Hence the gas fire can only be regarded as satisfactory if it passes the involuntary tests of the man who suffers from asthma; and if, by reason of improper construction or erection, it fails to pass, the fire must be condemned as really unfit for use even by persons enjoying perfect health.

It is a well-known fact that many physicians still look with unfavorable eyes upon a gas fire of any kind—a few notable authorities to the contrary notwithstanding. There are several causes for this. Doctors are very human, and when their patients suffering from diseases of the respiratory system do not respond as quickly to the treatment given as the physician expects, he looks around for a scapegoat. Having read unfavorable reports of gas firing, where due differentiation between the various systems has not been made, or having had unfavorable experience in his own practice without the leisure to investigate the true cause, the physician offers up the gas fire as a sacrifice; and (it may be) the patient incontinently improves—the disease having by that time run its course. A case of this kind came under the writer's personal observation not long ago. A patient, liable to asthma, was recovering from a mild attack of pneumonia with a slowness disrespectful to the family doctor. He was in one of those small, low-pitched rooms that abound in suburban houses, which contain in one wall an iron receptacle for fuel bearing the same proportion in size to a proper coal grate as an opium pipe does to one used for tobacco. An incandescent gas fire stood in front, running night and day. The patient had had no asthma. One day the doctor peremptorily ordered the substitution of a coal fire for the gas. In 24 hours the increase of dust in the room set up a violent spasm of asthma, complicated by want of sleep through the almost uninterrupted stoking of the tiny coal fire by the nurse. In 2 days the gas fire was replaced; and, incidentally, an important convert to the hygienic superiority of gas firing, when properly managed, was obtained.

Physicians are not likely to be prejudiced against gas firing except as a result of unhappy experience or incorrect information. But there is another skilled class of the community who should be most distinctly prejudiced in its favor. Properly trained nurses who have taken up private practice are somewhat opinionated women, but they are highly intelligent; and the work they have to do is almost halved when there is a gas fire in the patient's room. Yet in the writer's experience (and it has been unusually wide), most of such nurses with whom he has come into family or personal professional contact have entered his house inimical to gas firing, and have quitted it converted—not from laziness. Thus the question arises: Why, although gas firing has undoubtedly made rapid strides of late years, is its progress still so slow, and why are so many doctors and hospital trained nurses opposed to it? Gas companies and the makers of fires are constantly bringing such apparatus before the notice of the public, so that general ignorance cannot be pleaded as the cause. The real reason is that a very large proportion of the experiments made by the public in this direction have proved distinct failures; frequently because badly designed or constructed apparatus has been installed, but more often because the installation has been carried out in an improper fashion.

The latter accusation may be studied first. In nearly all cases when a good gas fire has been unsatisfactory in use, the fault lies in the arrangements made for the removal of the combustion products. Sometimes a self-satisfied fitter will knock a hole in a side wall of the house, connect up the fire through two elbows to about 6 feet of vertical pipe outside, erect a cap on the top, and forget that there will be a downward current every time the wind beats against the wall. But, apart from this idiocy, a gas fire is handicapped in all houses in which the brick chimneys have been built according to modern enactments to suit coal firing, because the traverse area of the chimney is too large. Six or more feet of sheet iron piping run up inside the chimney helps the draught to some extent—possibly by a kind of injector action; but still unless one or more of the contiguous chimneys are heated by other warming apparatus, the brick walls near the top of a tall house are not sufficiently raised in temperature by the gas combustion products to keep the products from cooling. Hence the upward current is checked; the cool but foul air in the upper part descends again at the edges of the chimney, and sometimes enters the room when it is tightly closed against the air elsewhere. An obvious cure for this

1. *Journal of Gas Lighting.*

would be to lead the iron flue right through the chimney till it projects above the "pot;" but the proper remedy is a provision of inlet ventilation. The necessity for positive inlet ventilation in the houses of the middle class—coal firing or gas firing—is almost wholly ignored; dependence being placed (when the matter receives any thought at all) on the porosity of the walls and the floors, and on the cheap carpentering of the window frames.

From the day, 30 to 50 years ago, when houses were built as solid self-contained blocks, to the time when the modern flat was introduced into this country, surburban residences were constructed with "additions." This addition at the back contains a different number of storeys from those in the house proper; and therefore the chimneys of rooms on approximately the same floor are of different heights. Thus when all the windows are closed, and a fire is alight in a room with the taller chimney, if the interior doors are open, air to supply the fire is drawn down the shorter chimney of an unwarmed room usually on the same floor; while if the fire in question is powerful—much more powerful than the fire in the room where the shorter chimney is—air will be similarly drawn down, accompanied by combustion products, even when a smaller fire is alight in the second room. This can be demonstrated in the popular manner best understood by the non-technical householder, by showing him how his brass ornaments near the weaker fire become tarnished by the "sulphur." Of course, all this applies to coal firing equally to gas firing. In the former case, however, the descending air is laden with the odor of "soot," which is so intolerable that measures are at once taken to stop the nuisance. When only gas fires have been used, the chimneys are clean inside; and as the combustion products of a good gas fire when fully alight are sensibly odorless—at least to the untrained and not particularly sensitive olfactory organs of middle aged and elderly non-chemical persons—there is nothing to show (except the tarnishing of brass) that the down-current exists. The trouble is accentuated in populous neighborhoods, where the houses are built with additions, by the number and irregularities of adjacent steeply sloping roofs, which assist in determining an actual down draught in some chimneys when the wind lies in a certain direction, even when no assistance is being given by the siphoning action of other taller chimneys.

This defect in houses with additions is not to be cured by building all the chimneys of the same altitude; because, apart from prohibitory reasons of an æsthetic and constructional character, a chimney projecting so far the roof of a low addition as would bring it to the same height as the chimney in the house itself, would be exposed to so much cooling action in its upper portion as to be practically useless. Neither is the trouble to be cured by having some of the windows constantly open, so that fresh air may be drawn in without friction. In busy neighborhoods, such as London suburbs, windows cannot be kept open constantly—the dirt and the local noises prevent it. The cure is the application of an intelligent system of inlet ventilators. When a good gas fire is installed in the manner (somewhat extravagant, but hygienically superior) the writer prefers—viz., some few inches clear of the coal grate front, and without a plate round the elbow where it enters the chimney, or with a silent mica-flap outlet ventilator in its own brick chimney at the top of the room (the plate round the elbow being then used) the burning gas fire will ventilate the room as efficiently as any coal fire, always provided that an equivalent quantity of fresh air is absolutely unhindered from entering the apartment. A powerful gas fire set back tightly against the chimney breast, with a well fitting plate round its outlet, and with no outlet ventilator near the ceiling, does not ventilate a room as well as a coal fire, and on occasion it may "smell" through the collection of dirt (dust of an organic nature) on inconspicuous portions of its hot surface. It seems impossible to teach ordinary people that the more the natural inlets of a room are blocked, the more "draughty" does the room become in the human sense of the word. Air must enter in sufficient quantity to supply the fire, etc.; and if the number of inlets is limited, the speed of entry increases. It is speed, not volume, in a current of cold air which we term draught A draught is often to be cured by making another.

Owing to the limitations mentioned at the commencement of this article, there is little more to be said about the defects of gas firing from a consumer's standpoint when hygiene is put in the foreground; because, as a class, incandescent gas fires are good, and fail primarily because they have been erected unsuitably. Nevertheless, results not wholly satisfactory are sometimes obtained with gas firing of this kind, even when the outlets for the combustion products are quite trustworthy. With the idea of achieving greater economy, fires too powerful for a room are sometimes adopted, especially such apparatus as comprise downward and lateral passages within their body for the better utilization of the heat before it escapes from the apartment. This system naturally increases the superficial area of hot, but not incandescent, material within the room, and hence tends to increase the proportion of heating effect due to convection as compared with that due to direct radiation; and the former, as is well known, should be kept as small as the pockets of the fire user will allow. But over and above this, an excessive area of moderately hot surface in a gas fire makes for a slight odor in an imperfectly ventilated apartment, for a reason which is not altogether clear. It presumably depends, however, at least to a large extent, on a slow incineration of organic dust on the hot metal; the dust being partly microscopic fibers of woollen material, and partly dead epidermis from ourselves, mixed with some road dirt entering through open windows or introduced on outdoor clothing, all of which becomes entangled with that mysterious substance known as "flue," and settles everywhere.

This reference to dirt and flue leads directly to the chief complaint that can be brought against many gas fires of the incandescent variety—viz., their inaccessibility for cleaning purposes. The gas jets of an ordinary fire lie very near the floor, and thus inject into the mixing tube a large proportion of the flue and dust formed in the room. In time this material carbonizes or partly burns in the tube, reducing its effective area. After a few months' continuous running, the tube becomes irregularly blocked, and the consequence in fires where all the burners are fed from the same original gas jet or collection of jets, is that the flames are higher on one side than the other. When the fire is turned down to a point considerably above the lowest at which it should work properly, it then flashes back, at least at one side, and the mixing tube receives a charge of carbon. Practically, the writer finds that a fire which runs night and day through the winter needs to have its mixing tube thoroughly cleared out every season; but he has also discovered that this is an operation impossible of performance. In certain types of gas fire, otherwise excellent, the mixing tube consists of an O-shaped pipe, broken in the center of one side for the gas jets and air inlets, and perforated along the other with the burner orifices. The bends, however, are so sharp that a wire brush or similar instrument cannot be run through it. Tapping on wood or stone does not remove the accumulated and carbonized deposit. Boiling in water is better, but not wholly effectual. All that is needed is that the tube should be drilled at both ends, tapped with a suitable gas thread, and gas plugs put in. Then the plugs could be withdrawn and the whole cleaned out properly. The writer has several specimens of one maker's fires where the mixing tube has orifices at the ends (presumably for convenience in casting it); but these orifices are filled with non-removable plugs riveted or otherwise fixed in.

Another trouble with old gas fires which are still in use is due to the addition of water gas to the coal gas they have to burn; the gas jets and air inlets not being adjustable. The makers are, of course, not to blame for this; but care should be taken that all modern fires sold for employment in districts where the proportion (if any) of water gas is liable to vary should be given proper adjustability. The writer has recently had to take heroic measures to stop the "popping" noise made by a favorite old fire in his bedroom when turned down to a certain point, as he was beginning to suffer seriously from insomnia. Consumers are not all millionaires prepared to purchase new fires each time the makers introduce improvements; so perhaps if new adjustable burners suitable for easy application to old stoves, or other devices with the same object in view, were to be put on the market at low prices, they might sell well in proper neighborhoods, and a slight but distinct grievance against modern gas firing be prevented from growing to serious proportions.

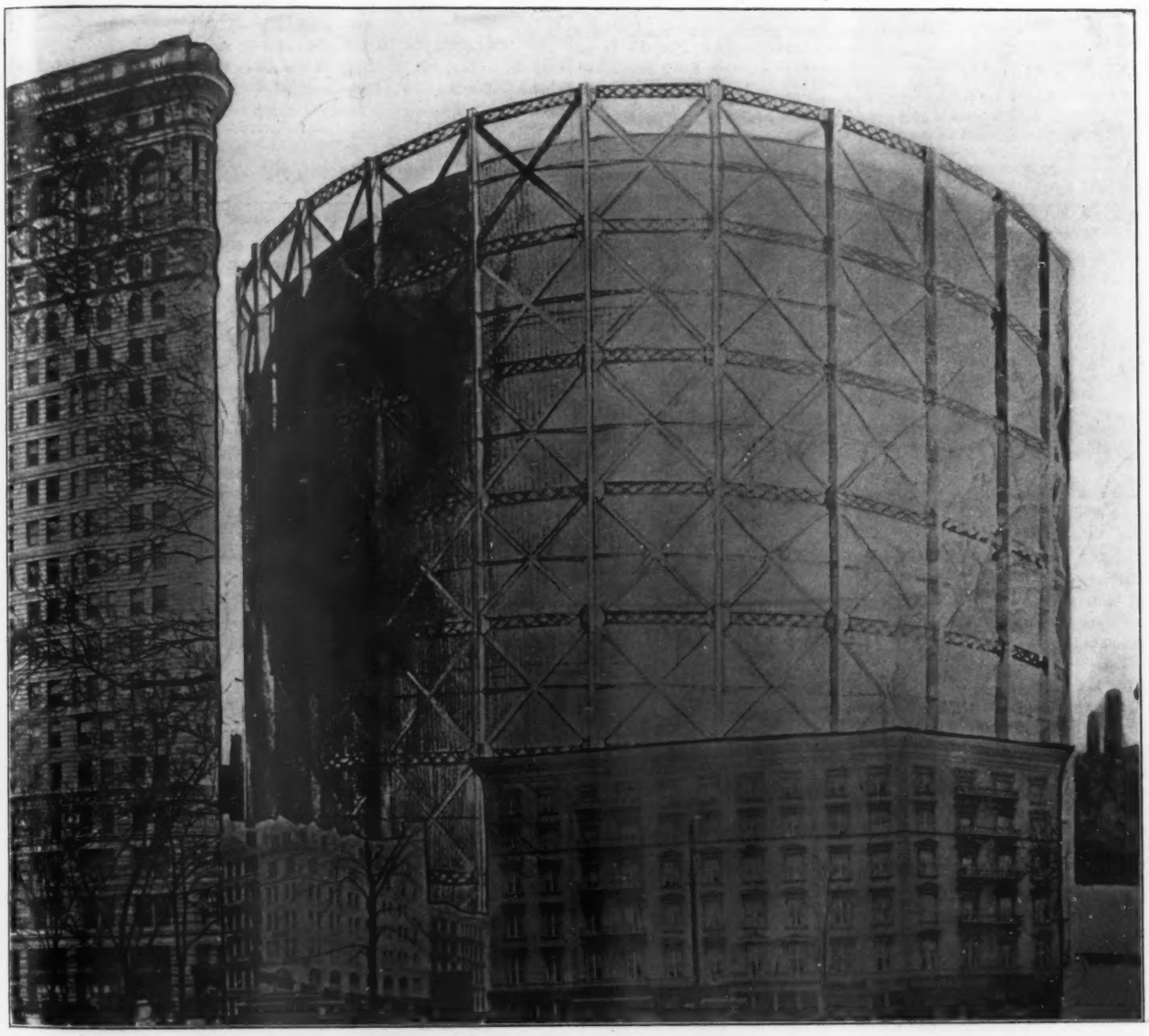
Within a comparatively short period of time, the incandescent gas stove with its "iron fire" or with "iron frets," which was so popular, has almost disappeared from the market, and its place has been taken by the apparatus with "ball fire." This may well be a distinct advance from a technical aspect; but from the standpoint from which the present article is written, it is questionable whether the change is altogether an improvement. In exhibiting a gas fire to a possible purchaser, or in making efficiency tests or the like with it, the fire is naturally run at, or close to, its highest point; but in everyday life, a gas fire is often wanted to give as little heat as it will. Owing to the large number of extremely warm days in the winter, when the air is very "damp"—that is to say, close to its saturation point—and owing to the sensitiveness of the semi-invalid to high saturation, the fire is quite frequently lighted in order simply to "dry" the air (*i.e.*, to decrease its percentage of saturation). Outside the laboratory air can only be "dried" by raising its temperature; but an amount of extra dryness (if the inverted expression may pass), gratifying to weak lungs and throat, can be conferred upon it by a very small rise in temperature. On these occasions, the invalid says he feels "cold," which is nearly always the human way of saying he feels "damp;" for if the temperature is raised appreciably, as shown by a thermometer, the same person soon proclaims that he feels too hot. Moreover, the sensation of being cold is usually a subjective one (in the circumstances with which we are now dealing) and, dyspepsia apart, immediately disappears when the person has ocular reason for making himself believe that he is cold no longer. A visible fire is thus the cure, but not necessarily a powerful or really heat giving fire.

Now, the modern gas fire, with clay balls, glows brightly enough when running at, or nearly at, full power; but, in the writer's experience, it gives distinctly less light—*i.e.*, heat to the eye, or radiant heat—when turned down to its lowest point. A fire with frets is incandescent at its lowest point; whereas to give an equal amount of light, and therefore organoleptic heat, a ball fire must be consuming more gas—so much more gas that when the thermometer outside is 50° or thereabouts, and a drizzling rain is falling, it cannot be tolerated in a room of medium size. It is quite possible to make a room look warmer, and at the same time to reduce its temperature, by lighting a fret fire, owing to the stimulated ventilation—a double effect at once gratifying and beneficial to the occupant whenever the day is "muggy." The iron fret is by no means perfect, for it warps until its middle portion no longer glows properly. But the frets are so cheap that they can be renewed without sensible cost. In these circumstances, the writer cannot refrain from regretting the old fret fire, from usually retaining it himself, and from recommending it to friends of the proper temperament.

All this is pure and ridiculous sentiment, no doubt; but if the world

is controlled primarily by money, sentiment takes no bad second place as a compelling force.

Since the foregoing article was put in type, the author wishes it to be made abundantly plain that, when referring to non-condensing incandescent gas fires, he means only the complete, self-contained incandescent fires, sometimes termed "frame fires." The plan of building an erection of clay balls or the like inside an existing coal grate, and heating them by means of bunsen burners fixed underneath, was not contemplated for various obvious reasons.



The Largest Capacity Gasholder in the World.

The photograph shows an illustration of one of 6 gasholders that are now being built in Astoria, Long Island, by the Astoria Light, Heat and Power Company, to the order of the Consolidated Gas Company, of New York. The picture was made across Madison Square Park, at 23d street and Fifth avenue, showing the gasholder as if it stood on the site of the Fifth Avenue Hotel. It is interesting as showing the comparative sizes of the Flatiron building on the south, the Hotel being in the foreground. The holder itself is 300 feet in diameter, and when at its full inflation will be 260 feet in the air, or only 26 feet lower than the Flatiron building. The holder, as will be seen, extends from 24th street across 23d street, and if this huge steel structure actually stood on this site it would extend back to within about 100 feet of Sixth avenue. Each of these holders will hold 15,000,000 cubic feet. The largest working holder in the world to-day is that operated by the South Metropolitan Gas Company, of London, England, which contains 12,158,600 cubic feet, and which was built by Messrs. Clayton, Sons & Company, of Leeds. The Astoria plant when completed will have a per diem producing capacity of 240,000,000 cubic feet. The Astoria holders will rest in steel tanks, the same to be 48 feet, 6 inches deep.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE factory of the J. H. Gautier Company, famous among gas works builders for quite a half century, was considerably damaged by fire the night of the 24th inst. The newspaper accounts next day, however, of the happening were grossly exaggerated. The plant is located on the Morris Canal, between Essex and Greene streets, Jersey City, N. J.

MR. GERARD KREMERS, Secretary and Treasurer of the Milwaukee (Wis.) Gas Light Company from 1861 to 1893, died at his home in that city the morning of March 20th. He was born in Rhein Province, Germany, and settled in America, at Manitowoc, Wis., in 1848. He was in his 79th year.

"L. H.," writing under date of March 26th, incloses the following: "The big gas well near Caney, Kas., which, struck by lightning about 3 weeks ago, has been a volcano since that time, was bombarded on the 23d inst. by a field piece with only trifling results. Since the well was first ignited the brains of the well owners' engineers, aided by volunteer advice from all over the country, have been devising methods of extinguishing the blaze so as to stop the fearful waste. The engineers finally settled on the device of manufacturing a heavy hood or cap of iron, in the shape of a kettle or cauldron, which was to be dropped over

the mouth of the well. A big traveling crane with a very long boom was to be pushed by man power close enough to the wall to allow the hood to be lowered over the aperture. The men were meanwhile to be sprayed with a stream of water from a steam pump to moderate the heat from the flaming gas. At the first attempt the hood dropped from the crane before it reached the well and the men fled. Later the hood was recovered and dropped over the well, the crane being partially burned in the work. The hood was partially shattered by the fall, but covered the aperture sufficiently to prevent the flame from spurting vertically into the air. The flames burst forth horizontally, making close approach still more difficult than it had been before. The cannon was used in an effort to knock the metal away from the well, that the flame might again spurt up vertically. Four 4-inch balls were fired, 3 of which hit the target, knocking off some of the connections. Efforts are being made to get grappling irons fastened in the obstructions to drag them away. A new hood is being made at Independence, and the burned crane is being rebuilt at Chanute."

A CORRESPONDENT in Syracuse, N. Y., forwards the following under date of the 26th inst.: The investigation into the affairs of the Syracuse Lighting Company by the Commissioners on Gas and Electricity for the State of New York was begun same days ago, the sessions being held in the City Hall, Council Chamber. In opposition to the Lighting Company's interests appeared Corporation Counsel Magee, assisted by the well-advertised Professor Bemis, of Cleveland, O., together with Mr. F. E. Burnett, of the Economical Gas Apparatus Construction Company, of Toronto, Can., and Mr. F. B. Wheeler, formerly Manager of the Binghamton (N. Y.) Gas Company, but now with the Semet-Solvay Company. At this writing adjournment was made until the 29th of last month, to enable Judge Hatch, of New York city, Counsel for the Lighting Company, to fill an important legal engagement previously made. The hearing thus far has only brought out matters pertaining to charter and franchises granted in the early days of the business.

WE are indebted to Mr. Dwight Smith, Vice-President of Edward M. Deane & Company, of Grand Rapids, Mich., for the following information, which was forwarded under date of March 26th: "With the coming of next week there will be a general shifting of managers and department chiefs of the Edward M. Dean & Company gas properties. This is in pursuance of a plan which the firm has been maturing for some time past, and is for the betterment of the service. In every case where changes are being made they are in the nature of promotions. Mr. Harry B. Wales, who has been General Manager of the properties for the last 2 years, and who during this time has made his headquarters at Vincennes, Ind., and Salisbury, N. C., will return to Grand Rapids. His long absence from the city has been due to improvement work which was being done in Vincennes and Salisbury, and this being completed he will return here to make his headquarters that he may be more in the center of the various properties which the firm controls. These are the Vincennes Light and Power Company, the Rapid City Gas Light Company, the Salisbury Light, Power and Traction Company and the Alpena Gas Light Company. Mr. James Trimble, Manager at Alpena, goes to Salisbury in a like capacity, but W. S. Baldwin, formerly of Grand Rapids and Detroit, will remain in Salisbury as superintendent of gas manufacture. Mr. Trimble will be succeeded at Alpena by Mr. Woolsey Hunt of Grand Rapids. He has for some time past been in charge of the new business department at Alpena. Mr. F. P. Hooper, formerly Manager of the Cadillac Gas Light Company, but lately at Alpena as Superintendent, will become Manager of the Rapid City plant. Mr. Henry Frund will remain as Manager at Vincennes, but will have the assistance of Mr. Fred. Sheriff, formerly of Battle Creek and Muscatine, Ia., who will have the Superintendency of the plant."

AT the annual meeting of the Vincennes (Ind.) Light and Power Company, the Directors chosen were: Edward M. Deane, Dwight Smith, Benjamin P. Merrick, H. B. Wales, Henry Frund, J. W. Emison, J. D. Bayard, Jr., R. E. Purcell, W. H. Vollmer and Charles Burhaus. The annual reports showed that the Company had enjoyed a most prosperous year.

THE Consolidated Gas Company of New York, and its allied properties, have served notices of appeal to the Appellate Division of the Supreme Court, against the decision of the State Commission of Gas and Electricity, directing that on a named date the selling rate for gas shall not exceed 80 cents per 1,000 cubic feet.

THERE is very little doubt Messrs. H. W. Mahaney, and W. F. Kyle are earnest in their assertion that they will build a gas works in Great Falls, Mont. Mr. Kyle is a resident of Spokane.

MR. A. E. BROTZMAN has resigned from the office staff of the Easton (Pa.) Gas Company.

AT the annual meeting of the shareholders in the Western Gas Company, the only change made in the Directorate was the substitution of Mr. Henry B. Wilson for Mr. S. J. Glass, who declined a re-election.

AT a recent meeting of the shareholders of the Pacific Gas and Electric Company it was voted to increase the bonded indebtedness of the Company from $10,350,000 to $14,850,000.

IT is more than probable that the New Haven (Conn.) Gas Company will this season extend its mains to Branford.

MR. AMD MRS. ARTHUR E. BOARDMAN sailed for Europe, per steamship Bluecher, the morning of the 22d ult. They will remain abroad about 6 months, the major portion of the stay being Dresden. Mrs. Boardman's spacialty or study is china.

FROM the 1st inst., the ruling selling rate at Hollidaysburg, Pa., has been put at $1.30 per 1,000 gross, with 10 cents off for prompt payment—within 15 days.

THE affairs of the Gas and Electric Development Company, of Philadelphia, Pa. (so "L. S. T." is hereby informed) are: President, H. C. Case; Vice-President and Engineer, A. B. Beadle; Secretary and Treasurer, W. W. Levering; Superintendent of Construction, S. S. Ingman; Counsel, Messrs. Roberts and Measey. The home address is "Hale Building," 1328 Chestnut street; the New York address is 82 Beaver street. The reason that this reply is made instead of by letter is that our correspondent failed to inclose a postage stamp for the return.

"W. A. F.," writing from Cambridge, Mass., under date of the 26th inst., incloses the following: "The employees of the Cambridge Gas Light Company held their annual dance in Cypress Hall, Malta Temple, at the appointed time, and the attendance was so much larger than had been estimated that it was necessary to open another room in the building and hire a second orchestra. The guests of honor were the President of the Company, Mr. W. A. Bullard, and its Treasurer, Mr. A. M. Barnes."

THIS is a matter of record, and for it we are indebted to Mr. S. A. Bliss, of Troy, N. Y.: "David Fox, who was appointed Receiver for the Rutland Street Railway Company, July 20, 1905, by the United States Circuit Court, has rendered his report to that tribunal and has been discharged from the receivership. The property now reverts to the Directors of the Company, who will transfer it to the new company, the Rutland Railway, Light and Power Company, of which Mr. Fox is General Manager. The stockholders of the new Company have also met and authorized mortgages of $2,000,000, of which $1,200,000 will be issued presently for the purpose of retiring all bonds and the cancellation of all mortgages of the Rutland Street Railway Company, the People's Gas Light Company and the Chittenden Power Company, amounting to $1,800,000. It was also voted to issue bonds to pay all the obligations against the properties, which will leave the entire consolidated properties free from debt or other incumbrances, except the mortgage bonds. The capital stock will also be reduced from $2,750,000 to $1,500,000."

AT the annual meeting of the Hamilton (Ont.) Gas Company, held about a fortnight ago, the reports presented to the Directors showed that the doings for the year had been highly satisfactory. The increase in sendout amounted to a percentage of 10.09, and the usual dividend of 8 per cent. was declared. The Directors elected were: Wm. Gibson, John Proctor, F. W. Gates, Wm. Hendrie, John Eastwood, D'Arcy Martin and R. C. Fearman.

AT a meeting of the Executive Committee of the Southwestern Gas and Electric Association, held in Dallas, Tex., about a fortnight ago, the programme for the annual meeting, to be held in Galveston, Tex., May 16, 17 and 18, was virtually arranged. We hope to have the details thereof in due time. Messrs. M. M. Phinney (President) and E. B. Megginnis were prominent factors in the meeting.

Mr. ALAN POLLOK has resigned from the service of the San Francisco (Cal.) Gas and Electric Company.

MR. L. J. CARDER leaves the services of the Brooklyn Borough Gas Company, of Coney Island, N. Y., to take charge of the distribution system of the new plant that is to be built by the Rio Janeiro (Brazil) Tramway, Light and Power Company, which plant will be constructed under the direction of Mr. A. B. Slater.

WE understand that Messrs. Child, Hulswit & Company, of Grand Rapids, Mich., are now in complete control of the properties of the Fort Dodge Light and Power Company, of Fort Dodge, Ia.

THE AMERICAN GAS LIGHT JOURNAL

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MONDAY, APRIL 2, 1906.

The Market for Gas Securities.

There is nothing much to say about the prices for local gas securities, unless it be to remark that those old investors who parted with their holdings at the prices that ruled during the week, and that are ruling now, were not wise. If the Consolidated gas makers cannot make the best of a bad situation we mistake them, for most of the transfers are going into the hands of those well identified with the Company. The 80-cent rate is sure to be officially promulgated, but there is such a thing as rectification. Confiscation may not go, even if "small politics" is back of the play.

Peoples, of Chicago, is more than steady, and Brooklyn Union looks the best thing on the list. Washington (D.C.) maintains its strength.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

APRIL 2.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	143¾	144
Central Union, Bonds, 5's	3,000,000	1,000	108	110
Equitable Bonds, 6's	1,000,000	1,000	..	105
" 1st Con. 5's	2,300,000	1 000	118	120
Mutual	3,500,000	100	255	270
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co. .. Bonds, 5's	11,000,000	1,000	105	107
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	..	98	104
Northern Union, Bonds, 5's.	1,250,000	1,000	105	107
New York and East River .. Bonds 1st 5's	3,500,000	1,000	108	111
" 1st Con. 5's	1,500,000	..	104	110
Standard	5,000,000	100	140	160
Preferred	5,000,000	100	155	175
Bonds, 1st Mortgage, 5's	1,500,000	1,000	111	114
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	129½	131½
" " Bonds (5's)	15 000,000	1,000	112	113
Bay State	50,000,000	50	⅝	..
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	509,000	1,000	95	100
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
d " " "	3,000.000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	10	12
" " Bonds, 5's	5,250,000	1,000	75	80
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	106¾
Cincinnati Gas and Electric Co.	29,500 ,000	100	101¾	102
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	90	..
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	..	95
Preferred	3,026,500	100	107¼	108
Consumers, Toronto	,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	85	87
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co	5,000,000	50	..	50
" Prior Lien 5's	4,618,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
For Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	110	112
" Bonds, 5's	10,500,000	..	107¼	108½
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	.	105
Preferred	2,500,000	100	95	110
Bonds	10,000,000	1,000	108½	109
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	6,000,000	..	137	138
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	94¾	95
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	104½	105¼
San Francisco, Cal.	15,800,000	00	58½	58¾
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	98	..
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	113½	115
General Mortgage, 5's	2,465,000	1,000	96¼	..
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047 000	1,000	102	..
Washington, D. C	2,600,000	20	300⅝	302½
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del	600,000	50	230	..

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DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO., N. W. CORNER BROAD AND ARCH STS., PHILADELPHIA, PA., March 14, 1906.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable April 14th, 1906, to stockholders of record at the close of business, March 31, 1906. Checks will be mailed.

1606-4 LEWIS LILLIE, Treasurer.

SPECIAL NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO., N. W. CORNER BROAD AND ARCH STS., PHILADELPHIA, February 14, 1906.

The Annual Meeting of the Stockholders of The United Gas Improvement Company will be held at the office of the Company, Northwest Corner of BROAD AND ARCH STREETS, PHILADELPHIA, on Monday, May 7, 1906, at 12 o'clock, noon, for the purpose of electing a President and six Directors, to serve for the ensuing year, considering and acting upon the subject of a proposed increase in the capital stock of the company from 734,500 shares of the par value of $50 each, to 918,005 shares of the par value of $50 each, and transacting such other business as may properly come before the meeting. The stock transfer books will be closed from 3 P.M., April 25, until 9 A.M., May 8th, 1906.

By order of the Board of Directors.

1606-3 W. F. DOUTHIRT, Secretary.

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A Situation as Superintendent of a Gas Company,

By a man of wide experience. Can show the very best results in operating and developing gas properties. Can furnish the best of references. Can be engaged at once. Age, 40.

1607-2 Address, "G.," care this Journal.

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A young man with some experience in the gas business, and competent to read gas meters, both regular and prepayment, but having some knowledge of setting and adjusting meters. Permanent position and good salary for the right party.

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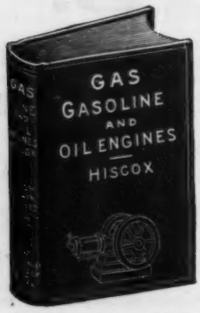

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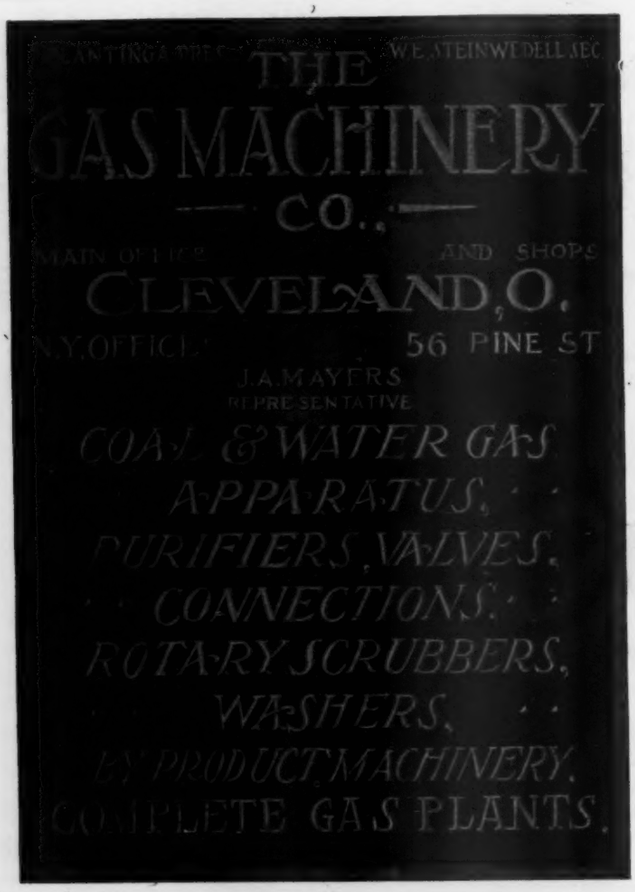

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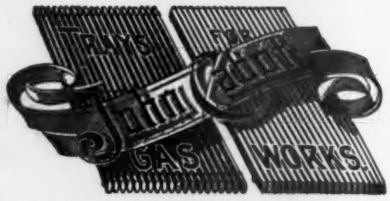

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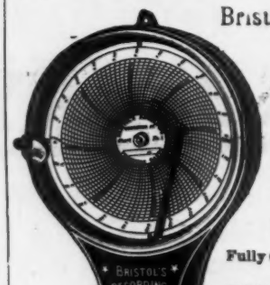

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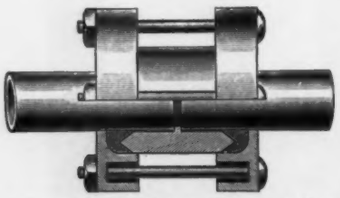
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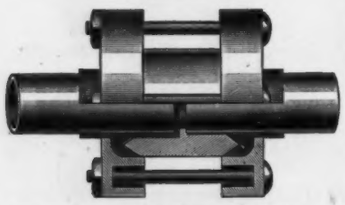
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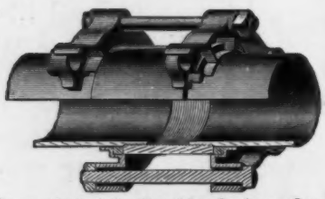
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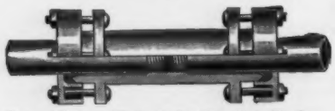
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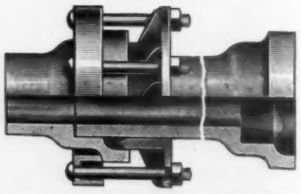
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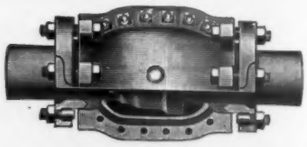
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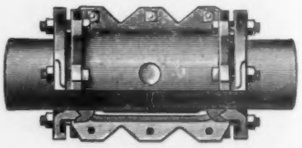
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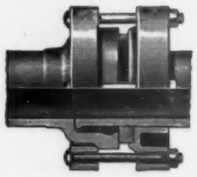
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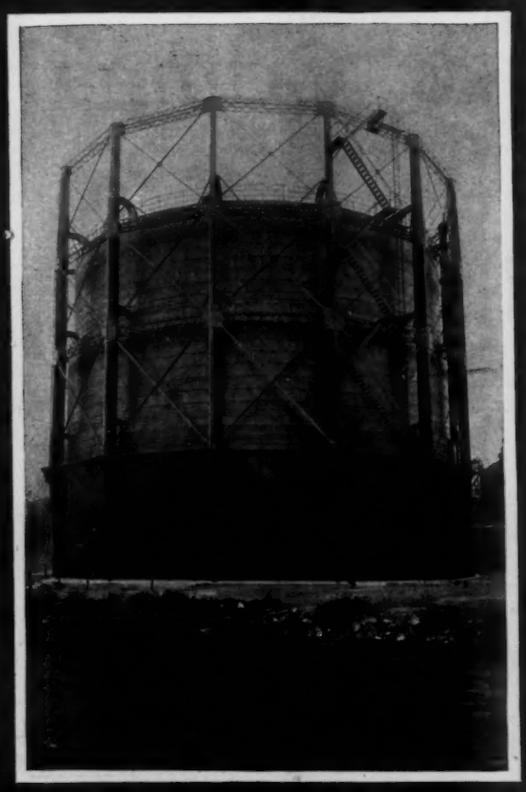

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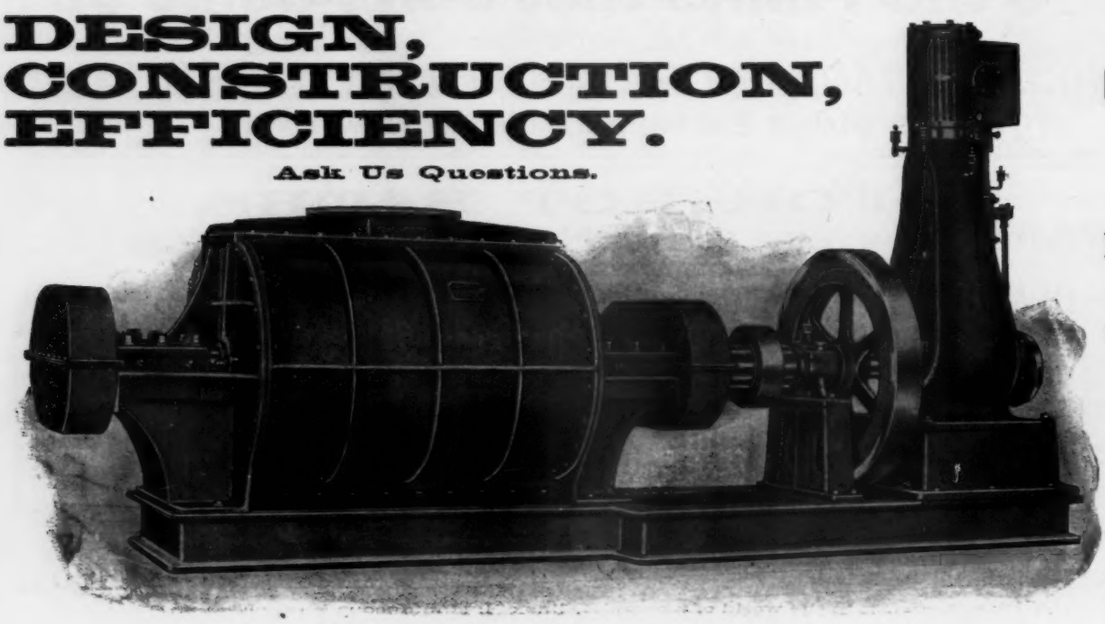

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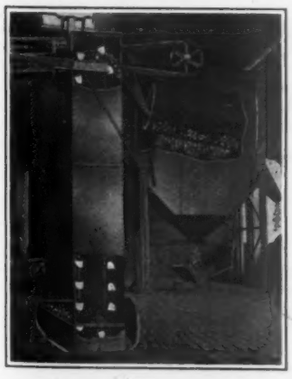

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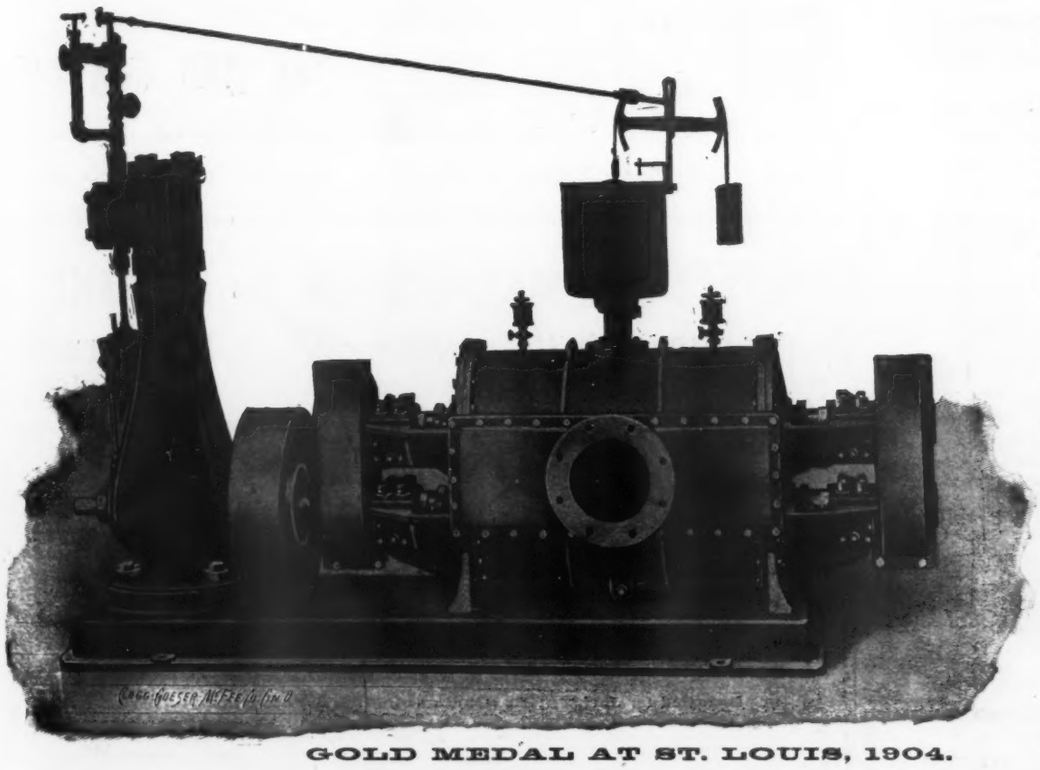

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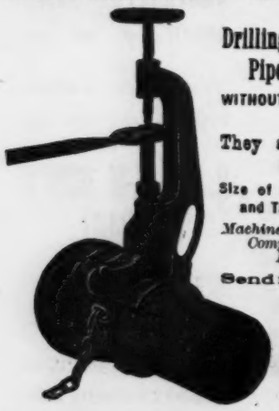

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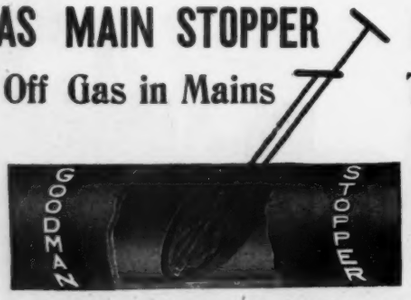

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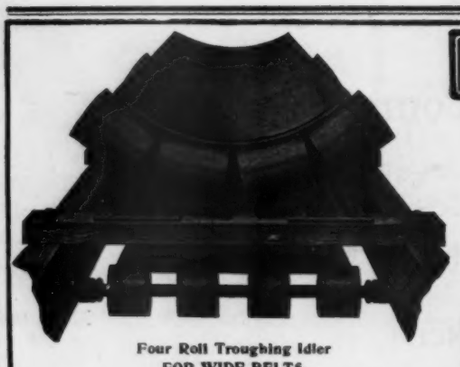

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Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

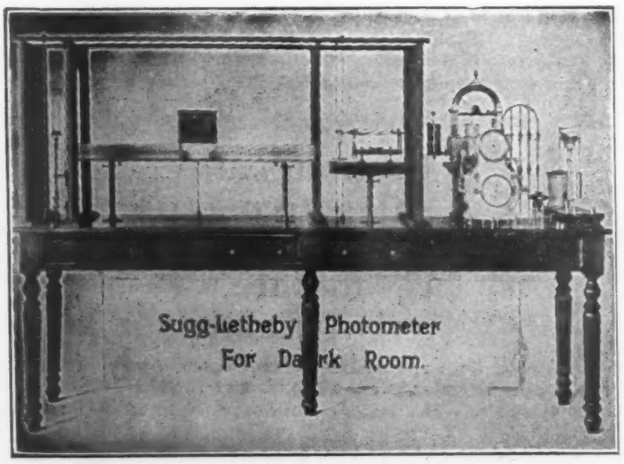
APRIL, 1906.

Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Sun.	1	12.30 AM 2Q	4.40 AM
Mon.	2	1.10	4.40
Tue.	3	2.00	4.40
Wed.	4	2.40	4.40
Thu.	5	3.20	4.40
Fri.	6	3.50	4.40
Sat.	7	No L.	No L.
Sun.	8	No L FM	No L.
Mon.	9	No L.	No L.
Tue.	10	7.00 PM	9.20 PM
Wed.	11	7.00	10.40
Thu.	12	7.00	11.50
Fri.	13	7.00	12.50 AM
Sat.	14	7.00	1.50
Sun	15	7.10 LQ	2.40
Mon.	16	7.10	3.20
Tue.	17	7.10	4.00
Wed.	18	7.10	4.20
Thu.	19	7.10	4.20
Fri.	20	7.10	4.20
Sat.	21	7.10	4.20
Sun.	22	7.20	4.10
Mon.	23	7.20 NM	4.10
Tue.	24	7.20	4.10
Wed.	25	7.20	4.10
Thu.	26	7.20	4.10
Fri.	27	7.20	4.10
Sat.	28	10.20	4.10
Sun.	29	11.10	4.00
Mon.	30	11.50	4.00

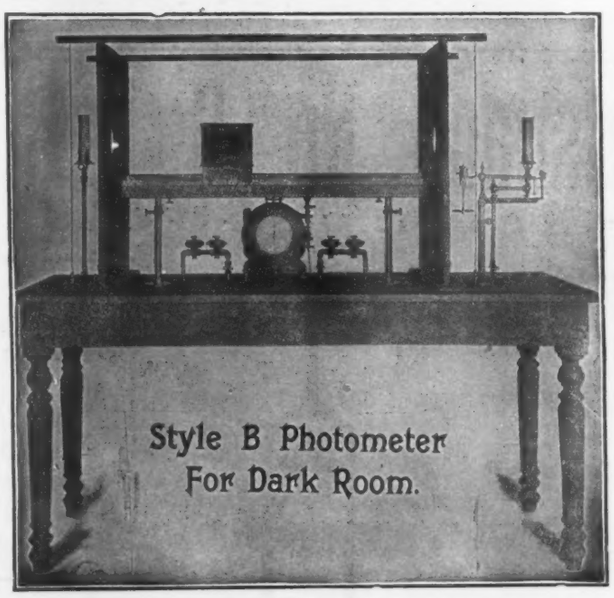
TOTAL HOURS DURING 1906.

By Table No. 1.

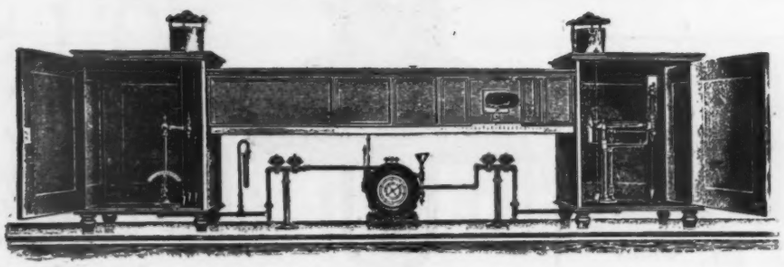
	Hrs.Min.
January	223.40
February	190.40
March	192.10
April	167.00
May	152.20
June	142.10
July	150.20
August	157.40
September	170.00
October	185.10
November	201.40
December	214.00
Total, yr.	2146.50



Sugg-Liethe by Photometer For Dark Room.



Style B Photometer For Dark Room.



Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

APRIL, 1906.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. All Night Lighting. Light	Extinguish.
		P. M.	A.M.
Sun.	1	6.10	4.55
Mon.	2	6.15	4.40
Tue.	3	6.15	4.40
Wed.	4	6.15	4.40
Thu.	5	6.15	4.40
Fri.	6	6.15	4.40
Sat.	7	6.15	4.40
Sun.	8	6.15	4.40
Mon.	9	6.25	4.30
Tue.	10	6.25	4.30
Wed.	11	6.25	4.30
Thu.	12	6.25	4.30
Fri.	13	6.25	4.30
Sat.	14	6.25	4.30
Sun.	15	6.25	4.30
Mon.	16	6.30	4.20
Tue.	17	6.30	4.20
Wed.	18	6.30	4.20
Thu.	19	6.30	4.20
Fri.	20	6.30	4.20
Sat.	21	6.30	4.20
Sun.	22	6.30	4.20
Mon.	23	6.40	4.10
Tue.	24	6.40	4.10
Wed.	25	6.40	4.10
Thu.	26	6.40	4.10
Fri.	27	6.40	4.10
Sat.	28	6.40	4.10
Sun.	29	6.40	4.10
Mon.	30	6.45	4.00

TOTAL HOURS DURING 1906.

By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

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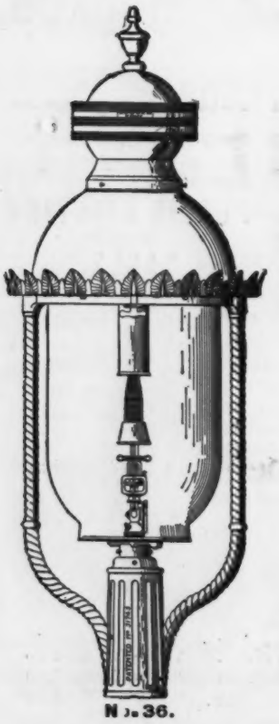

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By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

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Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

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Side Pilot By-pass Tube covered with refractory sleeve to prevent bending.

Fourteen-inch Opal Dome Shade.

Polished Brass Embossed Crown 2¼ inches high.

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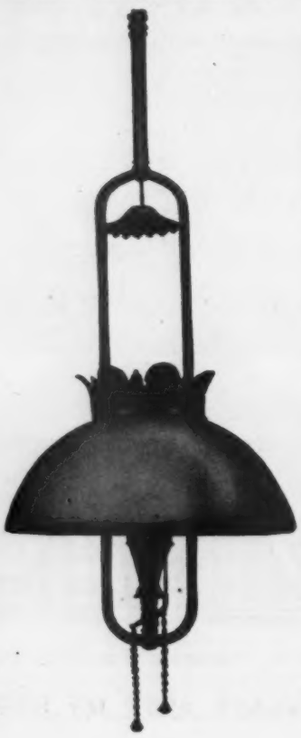

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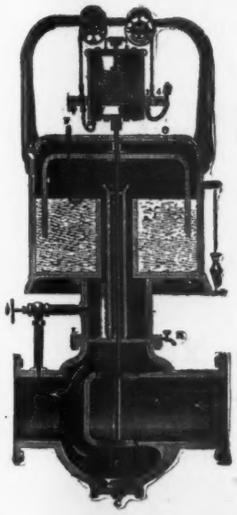

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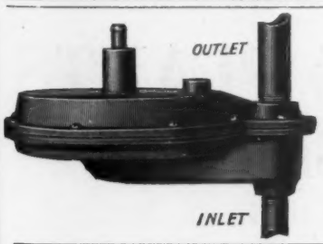

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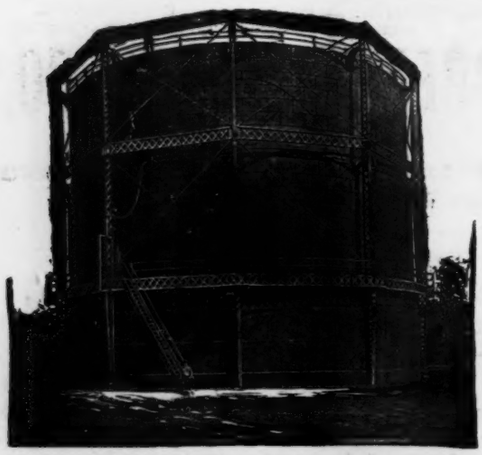

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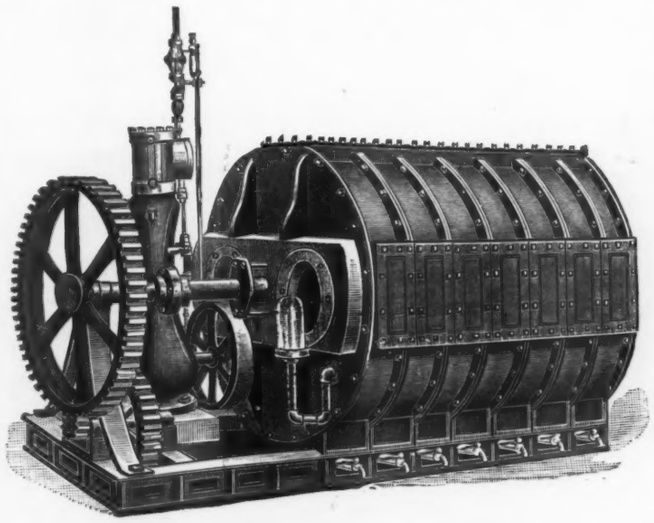

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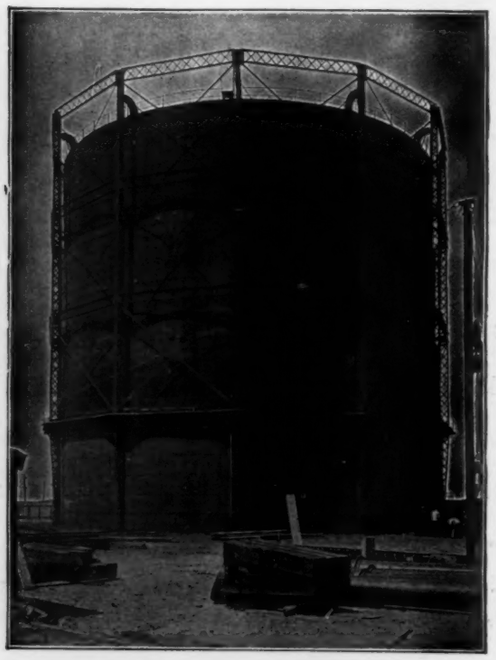

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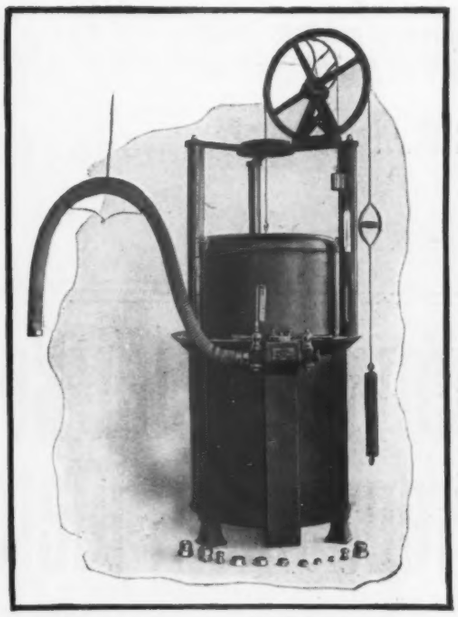

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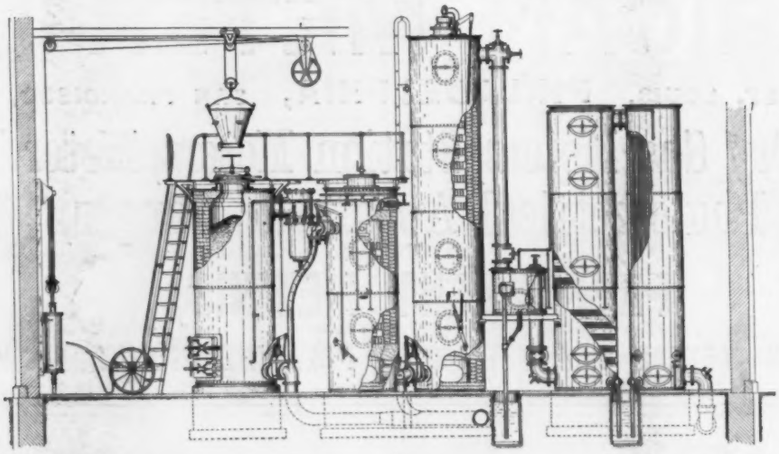

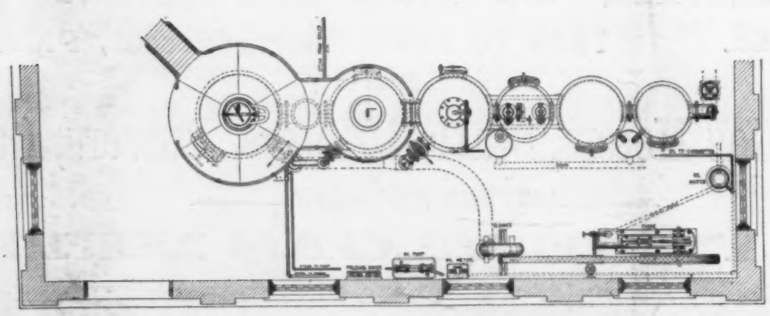

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